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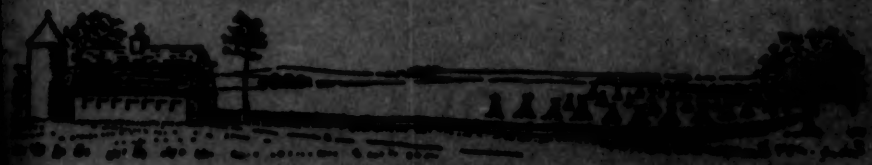

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The Farmer's Digest

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Progress in Pastures

Condensed from the Rural New Yorker

B. A. Brown

With last Winter's prevailing price of $105 for 16 percent dairy feed per ton, containing an average of 1,500 pounds of total digestible nutrients, a pound of digestible nutrients costs seven cents! This situation makes the use of home raised feed and pasture a very attractive financial practice. For example, a ton of ordinary hay, with an average of 1,000 pounds of digestible nutrients, has a grain replacing value of $70. But labor, machinery and storage space are now so expensive and difficult to get at any price that even home grown hay represents a large investment for harvesting costs alone. Under these circumstances, pasture, without any harvesting costs, should be utilized to the utmost to provide feed for livestock. It may be argued that roughages cannot replace much grain in the ration of a dairy cow without causing a serious reduction in milk. No doubt this is true of poor or even ordinary hay and pasture, but good to excellent quality roughages can replace a lot of grain without decreasing the milk flow.

Since 1921, the Agricultural Experiment Station at Storrs, Connecticut, has been experimenting with pastures. At that time, the most important question was how to improve, by practical methods, the hundreds of thousands of acres of rough, steep and practically untillable permanent pasture land so common in the Northeast, and especially in New England. With tillage and reseeding out of the question on such land, the only practical method of improvement was to apply fertilizers on the surface. Machine mowing to determine yields was not possible, either. Therefore, a grazing experiment was started on a typical rocky, brush covered unproductive pasture with acid, phosphorus defi-

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cient soil, to learn the effects of different fertilizers in varying amounts and frequencies of application. That experiment has furnished much pertinent information on the effects of fertilizers on the soil, the kinds of plants, and the production of feed.

The first fertilizers were applied in 1924, and before the end of the second season after fertilization, it was apparent that phosphorus was essential for improvement. All of the pastures given superphosphate (16 percent) at 500 pounds per acre, either alone or with other fertilizers, had remarkable increases in native white clover and Kentucky bluegrass and corresponding decreases in weeds and bushes. Analyses showed that the treated soil had much more available phosphorus and that the clover and grasses were also much richer in that element, so necessary for bone formation and milk production. Digestible nutrients (as measured by grazing) were nearly doubled and the 24-year average increase from superphosphate alone now stands at 70 percent.

Limestone, at one ton per acre, when added with superphosphate, produced changes even greater than those from superphosphate alone. The 24-year average increase in feed production is 113 percent. Thus, superphosphate and limestone have been widely accepted as a basic treatment for run-down pasture land. During the 24 years, a total of three tons of limestone, and superphosphate equivalent to about 2,600 pounds per acre of the 20 percent grade, have been applied to several of the experimental pastures. The annual acre cost of these materials was only $2.50. The feed nutrients obtained by grazing each year from an acre of the limed, phosphated pastures would now cost, in the form of grain, over $80.

In this experiment, potash has not had much effect. On pastures with sandier soils or on hay fields with either light or heavy soils, additional potash has been very effective and many times is a necessity for success with such highly productive legumes as alfalfa and Ladino clover.

Nitrogen alone caused little improvement, but with superphosphate or superphosphate and limestone, it has been responsible for still larger total yields than from the minerals. The extra growth from Spring applied nitrogen occurred mostly in May and June, when needed the least on most farms. Summer applied nitrogen, tested for 10 years, caused a little more Summer growth but not enough to justify the practice. In general, nitrogenous fertilizers are not recommended for unmowable pastures unless the additional May–June grazing stimulated by the nitrogen is needed in those months. Where nitrogen is

used, 150 to 200 pounds per acre of sulphate of ammonia or nitrate of soda are amounts which have given efficient results. In mixed fertilizers, 400 to 500 pounds of 7–7–7 will supply equivalent amounts of nitrogen, and also considerable phosphoric acid and potash.

It is sometimes stated that surface applied fertilizers do not penetrate far into the soil and consequently are rather ineffective. This has not been true in the Storrs and many other experiments. By 1941, the surface applied limestone had decreased the acidity as deep as the seventh inch of soil, and the superphosphate had increased the easily soluble phosphorus into the third inch. As most of the grass roots in permanent pastures are in the upper three inches, one should not expect larger yields from more deeply placed fertilizers. In actual experiments to answer this question, no better growth of bluegrass and white clover was obtained from harrowing fertilizers into the soil before seeding. In view of these results, tilling soils for the sole purpose of incorporating fertilizers cannot be justified.

Although permanent pastures are the cheapest source of feed and can be improved to utilize efficiently much of our vast acreage of rough, steep land, they do have serious limitations. Chief among such disadvantages is their very uneven seasonal growth. In the experiments at Storrs, two-thirds of the pasturage was produced in May and June, or in one third of the potential six months grazing period. This serious situation has not been alleviated much by any method of fertilization. Therefore, from July through October, other kinds of pastures must be provided as substitutes or supplements for the permanent type of pasture. Incidentally, no crop has been found which grows at the same rate throughout the season.

In an effort to find better pasture plants, many different legumes and grasses have been tested during the last 20 years. It was in such tests that Ladino clover was found to have excellent characteristics for seeded pastures. It is now history that on farms all over the Northeast, Ladino has fulfilled its early promise. In Connecticut, there is scarcely a dairy farm on which some Ladino is not grown and many use this wonderful clover as the mainstay in their pasture programs.

Because of Ladino's importance, many experiments have been and are being conducted at Storrs to learn which soils, seed mixtures, fertilizations and management are required for best results. The results are summarized as follows:

1. Ladino grows well on many types of soils, from sands to mucks and clays, but does best on the

moist ones. It has not survived very dry summers on droughty areas. Some losses by heaving have occurred on damp soils and this trouble has been much worse in pure stands. For this reason and also because mixtures result in higher yields, a grass should be seeded with the clover. Mixtures per acre such as one and one-half pounds of Ladino with either four pounds of orchard grass or eight pounds of smooth brome grass or three pounds of timothy have given excellent results.

2. If the soil does not contain large amounts of lime, phosphoric acid and potash, these mineral nutrients must be added for success with Ladino. A reaction of pH 6.0 or above is very desirable. To attain this, two or more tons of limestone per acre were found to be necessary on previously unlimed, strongly acid soils. After the first liming, a ton of limestone every four to five years is usually sufficient. Superphosphate (20 percent) at 500 to 600 pounds per acre should be applied before seeding and repeated every third year, or about 200 pounds added every year. Ladino is very sensitive to a shortage of potash and it has been determined that 10 to 12 tons of stable manure, with the liquid portion saved carefully, or 200 pounds per acre of muriate of potash should be spread on Ladino fields every year. Larger, but less frequent, applications are not satisfactory because the first crops absorb more than they require and the later ones may not get enough potash for good growth or even for survival.

3. Continuous grazing will soon eliminate Ladino. When most of a field has been grazed to two or three inches above the ground, the livestock should be removed and kept off until the herbage has grown again to a height of at least six and preferably eight to ten inches. Closer grazing with longer rest periods favors Ladino in its competition with accompanying grasses, more than a taller stubble but shorter ungrazed intervals. Mowing after each grazing period is a highly desirable practice, especially if grasses predominate.

4. In a long time experiment, a Ladino orchard grass seeding, cut when eight inches high to two inches above ground, had approximately the following seasonal productions of dry matter: May and June, 2,000 pounds per acre; July and August, 1,500 pounds per acre; and September and October, 500 pounds per acre.

Based on the fact that a 1,200 pound cow will consume 25 pounds of dry matter per day on good pasture, 80 "cow days" were available on these test pastures in May and June, 60 in July and August, and only 20 in the Fall months. If cut in late May for hay or silage, 1,000 pounds of dry matter may be expected in that

harvest, and if not grazed in June, 2,500 pounds will be available during July and August. After the heading period of the accompanying grasses, Ladino pasture can be held ungrazed for several weeks without marked deterioration in quality.

5. At 1947 prices, the grain replacement value of an acre of average Ladino pasture each year was, conservatively, $160.

The small grains, oats, barley, wheat and rye, as well as the hot weather crops of millet and Sudan grass, will supply much high quality pasture if seeded and grazed at the proper times. Thus, in Connecticut oats, seeded at the rate of two bushels per acre, in April, should provide about 80 cow days per acre of pasture from June 15 to July 15; Japanese millet, 25 pounds per acre, or Sudan grass, 35 pounds per acre, planted in early June may be expected to furnish 120 days of grazing between July 15 and September 15; barley or oats, two bushels per acre, started about August 1 will supply 40 or more days in September and October, the most difficult period in which to provide pasture. All of these crops should be liberally fertilized with manure or with enough fertilizer to supply 30 to 40 pounds of N per acre. A 7–7–7 mixture at 600 pounds, or 10–10–10 at 400 pounds per acre, are good general treatments. These annuals do not compare very favorably with either permanent or Ladino pastures in terms of total yield. They should therefore be considered chiefly as emergency or supplemental pasture crops.

In conclusion, it should be reiterated that Northeastern farmers have a wonderful opportunity to obtain a much greater part of the dairy cow's feed from pastures. A six months' grazing season (180 days) is a reasonable goal for most of the region. It should be remembered that a 1,200 pound cow can readily obtain her maintenance requirements and enough more digestible nutrients for about 25 pounds of milk per day from good to excellent pasture. The daily cost of an equivalent amount of feed nutrients in grain is now well over a dollar. At such values, practically any method of increasing the quantity and quality of pasturage has a good chance to be a profitable practice.

A Little Does a Lot

Condensed from The Farmer

William H. Kircher

"You asked about our loss of little pigs. It is around four percent. Certainly it isn't over five."

Fifteen minutes after we were told that by Prof. M. L. Buchanan, head of the animal husbandry department of North Dakota Agricultural College we were out in the college barns with him to see proof of what he had told us. We saw big, thrifty litters of pigs, some near market weight and others only a few days old. And we saw 75 or 80 head of the spring lamb crop, too.

What the College stockmen have done to cut losses of lambs and pigs, and to build fast gaining feeder animals can be done by any farmer, and it can be done cheaply. The secret lies in the feeding of what students of animal feeding call trace elements in feed; in this case cobalt and iron.

Although the story of how cobalt straightened out a flock of sheep is more dramatic than the pig story, we start with the pigs, then we'll tell how a band of sheep made an amazing recovery from what appeared to be worm infestation, but which turned out to be something entirely different.

Ever since farmers have tried feeding pigs on concrete they have known that all seemed to go well until the pigs were one, two or three weeks old, then there would be losses from anemia. Losses from all causes combined run up to somewhere between 35% and 40%. Those losses compared to the 4% and 5% at North Dakota Agricultural College would make it appear that M. L. Buchanan, has something in the way he is feeding iron and cobalt.

Of course we aren't forgetting that the general recommendation to avoid trouble with iron deficiency is putting some pieces of good black sod where the pigs can have free access to it. But hog men have experienced heavy losses in spite of sod feeding.

When tests were made of the blood of anemic little pigs it was found that there were 4½ to 5 grams of hemoglobin or red blood cells per 100 cubic centimeters of blood. Blood of healthy, vigorous little pigs contained about 8 grams

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per 100 cc. This much was known about the blood of pigs:

1. The red cell content of the pigs' blood at birth will approximate that of the sow.

2. What builds these red blood cells is not transmitted from sow to pigs through the milk. Therefore, unless little pigs start with a very high red blood cell content, it will drop to near the anemia-causing level before they are getting solid feed which is about three weeks after birth.

These facts indicated two courses of action. First, the building of red blood cells in the sows before farrowing would result in enriching the blood of the little pigs at birth. Thus they would start with richer blood to carry them over the danger point. Second, if the pigs were farrowed with the average red blood content of around 7 or 8 grams, the blood could be enriched by feeding iron directly to the pigs while they were small.

It was learned through trial—and some error—that feeding one-fourth ounce of copperas (iron sulphate) per day to sows throughout the pregnancy period would result in the sows' blood containing about a fourth more red blood cells than it would normally contain. Then when cobalt was added to the ration, the red blood cell content went up another one-fourth. Instead of the blood containing about 10 grams of red blood cells per 100 cc., at farrowing time, it contained nearly 15 grams! And the blood of the little pigs from these sows had proportionately more red blood cells to carry them through that critical period between farrowing and the time they were getting solid feed.

But how do you get so small a quantity of copperas in the sows' feed? What Buchanan has done is add a half pound of copperas to 100 pounds of the sows' mixed feed of grain and protein supplements when they are being fed grain and protein supplements in a mixture. If they are getting the two separately he adds 2½ pounds of copperas to 100 pounds of the protein supplement.

Cobalt is fed in even smaller quantities. One-half ounce of cobalt with 100 pounds of the salt the sows are getting will furnish all the cobalt they need. Of course, it is hard to distribute that small quantity of cobalt through such a large quantity of salt. For this reason the cobalt is mixed first with a small quantity of salt, perhaps a half-pound, then the half-pound is thoroughly mixed with about five pounds. The next step is mixing the five pounds thoroughly with 20 pounds of salt, and the 20 pounds then are mixed thoroughly with 100 pounds.

A way to boost the red cell content of the blood of little pigs during the first three or four weeks after farrowing is by drenching

them with a copperas solution two or three times each week. To make the solution, the copperas which is obtainable at any drug store, should be mixed at the rate of one pound to one quart of boiling water. Add two pounds of sugar to this mixture, and put the mixture in a big bottle.

One-third of a teaspoonful of this mixture is the maximum dose for pigs under one week of age. This dosage may be increased until the pigs are getting a teaspoonful when they are three weeks old.

Commenting about the pigs since starting this iron and cobalt feeding, Buchanan said that not only had there been no loss from anemia, but that there had been hardly any loss from sows laying on pigs. "The pigs just aren't around when one of those big sows rolls over to give her pigs their supper. They are out of the way, racing around her, each one trying to be the first of the litter to get started eating." That this is true is indicated by the result with last fall's pig crop. Litters from the eight sows farrowed averaged 10.1 pigs. At 4½ months of age there were 9.4 pigs per litter and their average weight was a little more than 160 pounds.

Early in the fall of '46 there was a band of February ewe lambs that had gotten into such condition that they were eating little hay and only about a tenth of a pound of grain a day. Of course they were losing weight. Their fleeces were shaggy, they were slow of movement, and had all the appearances of being heavily infested with worms. But worms couldn't be the trouble, Buchanan reasoned, because they had been on clean pasture all summer, and just to be doubly sure that there would be no trouble with worms, they had been treated. It was Burl Winchester, who had recently come from the University of Wisconsin to join the NDAC staff who suggested that the trouble might be cobalt deficiency. He had seen the same thing in a big band of ewes and lambs in Northern Wisconsin.

There had been 1,300 head of ewes and lambs in the Wisconsin flock. Losses were mounting in spite of the animals having been wormed. By spring of 1945 that flock was down to 200 head. It was decided to give them a mixture of trace minerals including cobalt. Results were amazing. The old ewes and the lambs started showing signs of recovery within a short time, and there wasn't a loss in the flock that summer!

Buchanan agreed with Winchester to try somewhat the same procedure with the college's ailing lambs. Results were just as amazing. Within a week after giving them the cobalt they were fighting to get up to the feed bunks. "That," Buchanan told us, "was the hungriest, greediest lot of lambs I have ever seen. They

fought like pigs to get to grain. Instead of limping along on a tenth of a pound of grain a day they were fighting to get all they could. Within two weeks they were eating two pounds a day, and they gained accordingly."

Sheep on the College farm now get cobalt in their mineral mixture along with salt, steam bone meal and phenothyazine. The mixture is made up of 45 pounds of salt, 9 pounds phenothyazine, ¼ ounce cobalt and 20 pounds of steam bone meal.

Whether the addition of cobalt to the sheep and hog ration will work such wonders in every Upper Midwest community is open to question. It may be that in some communities there is enough cobalt in the soil to provide a sufficient quantity in the feed grown on it. There is a chance, however, that your soil is just as deficient in cobalt as the College's land at Fargo. Anyway, it is cheap and it is easy to give cobalt a try if your sheep show symptoms of trouble as did the ones we have described.

New Frontiers in the Swine Industry

Condensed from the Hog Breeder

Robert Hunt
Washington State College

It is estimated that 40 to 50% of all hogs born in the United States fail to live to market age and weight. This represents a tremendous annual loss. Certainly none of our industrial plants could operate under such a handicap.

As a result of this mortality rate, the swine research program at Washington State College has been directed toward obtaining needed information to use in cutting down of "small pig losses." In the past few years, nine scientific publications dealing with the research findings at Washington State College have been published. The fundamental information obtained has not only been useful to the swine producer, but it has also been of considerable value in human nutrition. As evidence of this fact, it is interesting to note that some of the research work conducted with swine at Washington State College is being spon-

Reprinted by permission from the Hog Breeder, Chicago, Illinois, April, 1948

sored by organizations which are concerned primarily with nutritional studies.

The following are a few of the HIGHLIGHTS in swine research findings at Washington State College:

1. Lack of riboflavin (a vitamin found in green pasture or hay) resulted in all of the pigs being born dead or dying within 48 hours after birth. In other words, there was 100% small pig mortality.

2. A lack of vitamin B-I or riboflavin resulted in premature births. In extreme cases, they corresponded to a 7¾ month birth in the human.

3. The vitamin B-I content of pork may be enriched by feeding rations high in this vitamin, so that the daily B-I requirements of a human can be supplied in one pork chop, whereas it takes 10 pork chops from a pig fed a ration low in vitamin B-I to supply a human's daily vitamin B-I requirements.

4. Cull peas, a by-product of little value 5 years ago, have now been established as an excellent feed for swine. It is now felt that peas may come to mean to the livestock producer in Washington what soybeans and peanuts meant to the livestock men in central and southern states respectively.

5. It has been found that the ration a pig obtains during growth will influence its ability, 6 to 8 months later, to conceive, reproduce and lactate. In other words, one should feed prospective herd gilts a good ration during growth in order to prevent small pig losses.

A 10-year study on the effect of the planes of nutrition on the selection of meat animals for breeding purposes is underway. The information obtained will be applicable not only to hogs but also to cattle and sheep. The ultimate objective is to determine whether or not a person can select an animal for breeding purposes as efficiently on a low plane of nutrition as one on a high plane of nutrition. In other words can prospective herd sires be intelligently selected when in range condition or must they be fitted?

Haymaking The Modern Way

Condensed from the Kentucky Farmer

According to reliable authorities, two-thirds of the Nation's hay crop loses half of its nutritional value between the time the crop is cut and the hay fed. Throughout the country, however, farmers are becoming more and more aware of the importance of proper cutting and curing methods for early hay in order to get more and better sugar, starch, and protein content. They know that quick drying saves valuable plant vitamins, retains the leaves, keeps the green color, holds the aroma, and eliminates sharp, hard stalks and stems.

Today, farmers in widely scattered sections of the United States have found that they can overcome many of the problems and difficulties of haymaking by the use of a new type haymaking machine which does the work that no haymaking machine has ever been able to do before. The labor-saving piece of equipment cuts a seven-foot swath of hay, picks the cut hay up before it strikes the ground, and passes it between two steel rollers under just enough pressure to crack the stems without losing the juice from the plant. Years of careful field work have perfected the process of passing freshly mown thick stemmed hay crops such as alfalfa, clovers, and soybeans, between a pair of steel rollers, under a pressure of 1,000 pounds per square inch. This serves to "crack" the main stems of the plant (the long way of the stem) which in turn allows these thick stems to cure in the same time required for the smaller stems and leaves. By doing this "cracking" immediately behind the mower cutter bar, and while the plant is green and full of juice, no leaves nor other parts of the plants are lost. Hay made with this machine is finer in texture because of the cracked main stems, and so palatable to livestock that even the large stems are cleaned up. Whether hay is field-dried, mow-dried, or dehydrated; and whether the crop is alfalfa, clover, Ladino, soybeans, or a mixture of grasses and legumes, this practical machine enables the haymaker to make better hay, quicker and more economically.

One of the greatest advantages of this haymaker lies in the fact that it is possible for hay to dry in one-half the time so that, in good weather, the complete cycle of haymaking is a one-day affair. A popular slogan among users of

Reprinted by permission from the Kentucky Farmer, April, 1948

this machine is: "What you cut before 11: 00 you can bale before 7: 00!"

This haymaker may be attached to a tractor the same as any other farm implement that trails and is operated through the power takeoff. A heavy duty two-plow tractor is recommended, or if a three-plow tractor is available it should be used if hill conditions are involved. The seven-foot power takeoff mower is a standard production mower. The freshly cut hay falls back of the cutter bar and is picked up by the pickup fingers which transfer it to the space between the two large steel rolls. These rolls are adjustable for tension and are set so as to crack all stems but so as not to squeeze any juices out of the plant. The freshly cut material goes through between these rolls as a mat, very similar to clothes through a clothes wringer. The cracked material then drops back onto the stubble not in the smooth uniform way of a regular mower swath (in which the leafy part of the plant covers the stems and prevents rapid drying) but more like hay passed through a tedder. This permits more rapid curing and helps in the complete curing ready for storage the same day as cut, under favorable conditions.

The entire haymaker including mower, pickup and crushing attachments are raised and lowered by hydraulic lift operated from the tractor seat; this makes the equipment quickly and very easily controlled. The same acreage is cut per day as with regular seven-foot tractor mower. This haymaker will cut from 20 to 30 acres per day, depending on the size of the fields.

The Amino Acids

Condensed from Down to Earth

RECENTLY the amino acids have received the attention of both popular and scientific writers. Much more is to be heard of these organic compounds which make up proteins, for their synthesis by modern chemists holds out a promise for a more nutritional diet for both man and animal—and they are destined to play an important role in building new tissue and in speeding recovery for the patient in many types of surgery.

The amino acids are chemical compounds which are capable of combining to form complex proteins. In human and animal digestion proteins are broken down into their amino acid constituents and

Reprinted by permission from Down to Earth, Midland, Michigan, Spring, 1948

carried unchanged by the blood to build tissue. Surpluses are converted into by-products by the liver to be used as a source of energy. The story of their discovery spreads over a century of persistent research by chemists and doctors in several nations. Recent work with both man and animal has shown that there are eight amino acids essential to man and ten to most animals. Histidine, for example, is indispensable to the rat, as is glycine to the chick, but man thrives without either, since the human body can synthesize them.

Protein chemistry dates back to 1810 when Wollanston isolated sulphur-containing cystine. It was not until 1938 that the essential amino acids could be listed, along with nonessential—and these studies were all based on experiments with the diet of the rat. More recent work by research leaders at Illinois, Rochester, Johns Hopkins, and New York Universities and in many other medical centers has told a dramatic story in preliminary experiments with the amino acids in the diet of man—and in animal research centers these compounds have produced startling results in the diet of the chick, the dog and the pig[1].

The expression "essential" amino acids is frequently misunderstood. To the scientist an essential amino acid is one which the body cannot synthesize at all or at least not rapidly enough to meet nutritional needs and one which cannot be omitted from the diet without malnutrition. The nonessential acids may play an important role, too, for relatively little is known about them except that they may be removed from the diet without immediate signs of malnutrition. It is interesting to note, however, that the body sometimes uses an essential acid to synthesize a nonessential one when it is not present in the diet (phenylalanine from tyrosine).

Research leaders have discovered that we apparently do not store proteins or amino acids and that our daily needs for the essential acids are fairly constant. If we do not eat sufficient protein, our body continues to excrete through urine, feces and perspiration more than we assimilate through eating. A continued negative nitrogen balance means malnutrition and eventual death for man or animal.

All plants are capable of transforming inorganic nitrogen into protein, but the amount and kind of protein is not the same in different species of plants. The amounts of the essential amino acids vary widely in these plant proteins. When assimilated by an animal, the plant protein is first broken down to the simple amino acid or to a lower polypeptide, and these units are either used to rebuild tis-

[1] Down to Earth, Summer 1947.

sue protein or are eliminated from the system. Practically all vegetable proteins are lacking in sufficient essential amino acids to form a well-balanced protein diet. Therefore, it is necessary to add protein to the diets of most grain-fed animals.

Most grains and grain products and most vegetables are low in some of the essential amino acids. On the other hand milk and meats are good sources. The man who drinks milk and whose budget and stomach permit eating a few ounces of meat daily need not worry about a deficiency in the essential amino acids. But on a world-wide basis, the available amount of proteins for an adequate diet for man is appallingly low in proportion to the available amounts of grain and grain products. The situation in animal nutrition is even more critical.

Here in America feed companies buy thousands of tons of fish scraps and meat wastes to add to stock foods. But even here the needed amount of protein wastes available falls many thousands of tons short of current needs. And the picture promises to grow more alarming.

With the leaders in human and animal nutrition pointing to an alarming need for more proteins, and with doctors searching for amino acids more palatable and readily assimilated, the laboratory chemists went to work. All of the essential amino acids have been synthesized successfully from coal tar, petroleum or other equally available and humble materials.

The term vitamin was not established until 1912 and did not capture the public's attention until 1920—but then with a rather startling impact. While many people undoubtedly fortify themselves unnecessarily with vitamins and without professional advice, there is adequate clinical support for claims made when the need is genuine.

As vitamins and amino acids fulfill essentially different dietary needs, so are there differences in the way they are utilized by the body. Most important to the user, synthetic or naturally extracted amino acids are ready to build tissue in the form in which they are administered. Furthermore, they can be made more palatable to the human patient.

Chemical manufacturers, doctors, pharmaceutical houses and animal feed producers share a determination to keep these new synthesized tissue builders from being unduly exploited. The medical profession will point the way to the greatest needs and to proper administration. The doctors of our research centers will tell the detailed story, and pharmaceutical and chemical groups will provide the compounds. Interest in the amino acids is world-wide. So is the promise for combating malnutrition.

Beef on Concrete

Condensed from the American Hereford Journal

Clair M. Wolfe

One of the most unusual and interesting livestock producing operations in the "tall corn" state of Iowa is the four-farm set-up owned by E. R. McMichael, Shenandoah. This unique beef factory includes in all a thousand acres in the rich corn-producing area of southwestern Iowa.

The unusual feature of these farms in Page and Taylor counties is that they are all seeded down to grass without an acre in corn or small grain, and every bushel of corn used in the feeding operation, which has run as high as a thousand head of cattle and as many or more hogs per year, has been bought from outside sources.

The home place, has a total of 65,000 square feet of concrete-floored feeding lots for the cattle and hogs fattened on the McMichael farms.

The price situation since the the first of the year has somewhat upset the normal feeding operations, but generally only the highest-quality Hereford yearlings produced in the Nebraska Sandhills are purchased for the McMichael places and they are there pastured and fed to a top or near-top quality finish. Generally they sell at or near the top of the market.

At the present time, feeding periods have been shortened and fewer cattle are being handled than normally. The present feeding program, according to Clarence L. Wright, manager, is to give the cattle ground ear corn twice a day and chopped hay once a day for short periods of from 90 to 120 days.

Mr. Wright, who has been manager of the McMichael operations since Mr. McMichael went into the feeding business eight years ago, says that since most large feeders have to buy at least a part of their corn every year, it was their theory that they could operate advantageously on rolling land which was pretty well worn out from being over-cropped and work out a pasture-feedlot combination which would be very profitable. This idea has proved to have considerable merit, judging from the appearance of the farms.

Reprinted by permission from the American Hereford Journal, March 15, 1948

Their plan calls for the purchase of top quality Hereford yearling steers. As Mr. Wright says, "You can't get top quality finish if you don't have the quality to start with." These yearlings are run on pasture through the winter and then are gradually moved into the feedlots for finishing.

The feeding operations are all centered on the home place just east of Shenandoah where four large feedlots are located on a gradual slope to the east and south for proper drainage. A central alley or lane through the center of the feedlots is equipped with swinging gates which help in the sorting of cattle and hogs from any one of the four yards and make it possible to line up six or seven separate truck loads of livestock for shipment at the same time.

The feedlots are divided into four separate units. The cattle are first moved into the unit where the lot is half concrete and half ground, in order that they may gradually get used to the concrete floors. However, Mr. Wright says that the cattle definitely show a preference for the concrete floor when the weather is bad and the dirt portion of the lot muddy. For the final finishing operation, the cattle are moved over into lots where the floor is 100 percent concrete, and Mr. Wright says that he doesn't believe in feeding cattle on anything but concrete feeding floors.

"We have never sent any cattle out of our lots with sore feet," he adds, continuing: "I think that is something which buyers at the market appreciate and show in their bids. Another thing, we keep our floors clean and our cattle do not go to the market all muddy and dirty. These two factors of being 'good on their feet' and being 'clean' contribute a great deal to the good prices we usually get for our cattle."

Even the concrete floors should be cleaned at least once a week if weather conditions permit, Mr. Wright says. "We have a special tractor equipped with a blade which is interchangeable with a load scoop which serves that purpose very well," he added. As much as possible of the manure from the feedlots is spread back on the farms, the excess being sold to nurseries in Shenandoah.

The combination livestock-pasture operations which Mr. McMichael and Mr. Wright are carrying on has increased the value of the land immeasurably. The top soil no longer is disappearing and washouts and gulleys are a thing of the past on the farms. The value of the land has risen considerably above the average rise of prices on farm land in that vicinity due to the fact that the soil has been enriched by several years of

livestock operations without cropping.

The land has all been terraced, first being properly surveyed, and, as a result, the terraces have held even the heaviest rains. The water drains away so slowly that there is not the least sign of washing. If it is ever decided to put any of the land back into corn or other grain, it could be readily farmed on the contour because the terraces are not too abrupt and are wide enough to be worked without difficulty.

Practically every type of pasture grass has been tested on the four McMichael farms. The combinations used most successfully are timothy with red clover, or timothy with lepedeza.

On the home farm, alfalfa and brome grass together are used exclusively. Mr. Wright says they are able to carry one steer per acre of pasture on it through a practice of rotating the cattle from one pasture to another. The fact that the annual pasture grasses have reseeded themselves is good evidence that the McMichael farms have never been grazed too closely.

An added advantage of having all the land in pasture on this livestock-pasture operation is that it cuts machinery and labor costs to a bare minimum. In every possible instance, labor-saving machinery has been installed. With no crops to handle, all the men on the farms are able to join the haying crews when the time comes, and it is usually not necessary to hire extra help.

Included in the labor-saving machinery used is a one-man pick-up baler and elevator attached to a truck for loading baled hay. Another elevator is set up for piling the bales into stacks. The stacks are covered with canvas which keeps the hay from deteriorating in quality until used.

The feedlots on the home place were built with the idea of handling the maximum number of cattle with the utmost convenience to the operators. The lots were designed and built by Mr. Wright and include substantial and convenient fences, chutes and feed bunks.

All fences are painted white and are constructed of 2×4 planks bolted to 6×6 posts. To provide for extra strength, the posts are set only about four feet apart.

An unusual and handy feature is the alley through the center dividing the feedlots into two sections. This alley is equipped with swinging gates and connects with a loading chute which is conveniently near the all-weather road which runs past the farm.

The feedlots have a good windbreak formed by a high board fence built completely across the north side of the yards. On the farms where the cattle are pastured, they have plenty of good timber windbreaks.

Mr. Wright says he doesn't believe in loafing sheds for cattle raised on the range. "They don't know what a shed is," he says. "Our cattle never seem to mind the weather—they like it outside." Death losses in the eight years the lots have been operating are so low that they have not even been a factor. "We did lose two steers last year, but they were hit by lightning in the pasture and didn't die in the feedlot," Mr. Wright remarked.

The average for the past four or five years for this highly successful operation has been 1,000 cattle and hogs moving annually from the pasture to the feedlots and from there to market. Expansion plans for the future are to double this capacity. Future plans also include the installation of a weighing in and out scale of at least 50,000-pound capacity. This scale will be situated handily so it can also be used to weigh feed for the livestock.

It is impossible to separate the successful cattle feeder from the successful hog feeder and, on the McMichael farms, thanks to excellent care, 160 sows farrowed and raised to maturity about 1,050 pigs. The farrowing last spring was arranged so that the pigs arrived over a period commencing in May and ending in July, in that way, the labor load of caring for the young litters was eased.

All the pigs are farrowed in individual houses and on pasture. The houses are mounted on skids and can be moved easily and frequently to insure fresh pasture at all times. As a result, the pigs are never deficient in vitamins or protein when they are brought to the feedlots.

The feed Mr. Wright likes best during the sows' and gilts' gestation period is a mixture that includes 750 pounds of ground alfalfa, 1,000 pounds of oats or oats and barley, 100 pounds of soybean oil meal, 100 pounds of tankage and 50 pounds of mineral for each ton. This well-balanced ration is one reason a seven-plus average in pigs per litter was chalked up in 1947, the manager believes.

Sanitation and vaccination, both regularly practiced, are other favorable factors in producing large litters of thrifty pigs, he says. Finally, it is a cardinal principle that the pigs must have the closest attention from each farm operator during the farrowing season.

The development and expansion of this successful livestock-pasture operation is being carefully watched by officials of the Iowa State College at Ames who have expressed the opinion that this type of operation may well be the answer to the problem of worn-out farm land in many parts of the country.

An idea of Mr. Wright's is that water sanitation is highly important. All water tanks for the live-

stock are thoroughly and regularly cleaned out. "Gains are faster and the animals are much more healthy when they drink plenty of fresh water," Mr. Wright says, "and all our stock get plenty of good clean water to drink every day." Greater consumption of water in the winter time is promoted by the use of oil-burning tank heaters which keep the tanks on all the farms free from ice, no matter how cold the weather gets.

Twice a day at feeding time all the men on the place are in the feedlots. One hard and fast rule which Mr. Wright insists must be carried out at every feeding is that every steer in the lots must be gotten up on his feet and urged to eat. "Some old-time feeders think that a steer is making fat when he is resting, but I want every steer on his feet and eating at every feeding," Mr. Wright says. "That way you can tell the sick ones; if they won't eat, we find out why."

Mr. Wright makes a practice of being present at every feeding. He says he likes to see for himself how the cattle and hogs are doing, and that is the best time to tell.

Evidences of successful management are everywhere on the McMicheal farms. The feedlot floors are clean, the feed bunks and equipment are in good condition, and the yards and sheds reflect glistening white paint.

Hog Pasture

Sudan grass and alfalfa pastures paid off well in Indiana last year compared to dry-lot feeding. On the basis of relative feed costs of gains, alfalfa saved 2.5 cents per hog daily, and the Sudan grass, 1.4 cents. An acre of good alfalfa that would carry 20 full-fed hogs with a protein supplement, was valued at $15 a month.

Sudan grass was obliged to carry 36 similar hogs an acre to be worth $15 a month on the same basis. The Sudan was clipped twice during the period when observations were taken. All pigs had free-choice of shelled corn, protein supplement, mineral mixture, and loose salt.

—*Successful Farming*

Treatment for Foot Rot

Condensed from the Jersey Bulletin

Dr. William Hartnell

During the past four years veterinarians have been treating foot rot in cattle with sulfapyridine sodium and/or sulfathiazole sodium. Sixty grams of the drug used dissolved in 500 cc. sterile distilled water is administered intravenously (usually the jugular vein) or intraperitoneally.

All types and stages of foot rot caused by the organism, Actinomyces necrophorus, respond markedly to this treatment. Veterinarians in Florida have summarized the results obtained in 1,500 cases. Nearly 100% of cases treated with sulfapyridine sodium required no further attention, whereas about 25% treated with sulfathiazole sodium required two or more injections. This has also been my experience, although in some herds, where foot rot has been a major problem, a single injection of sulfathiazole sodium has been sufficient.

Following the injection of soluble sulfa, improvement is often noted the next day. Dairymen and cattle feeders in this area are particularly enthusiastic over the treatment. It is no longer necessary to lose milk, weight and occasionally an animal from foot rot. The earlier treatment is administered, the more prompt the response.

Foot rot caused by other organisms does not respond to this treatment. However, most foot rot is caused by A. necrophorus. Florida veterinarians have observed shock and convulsions in a few cows following the injection of sulfa. We have not observed these conditions in the treatment of several hundred cases.

Currently sulfapyridine sodium is manufactured only in Canada. The supply is often short, while the import duty causes it to be twice as costly as sulfathiazole sodium. However, both drugs are within financial practicability. Their use is much cheaper than the loss experienced with other methods of treatment.

Reprinted by permission from the Jersey Bulletin, Indianapolis, Ind., March 25, 1948

The Sweet-Clover Weevil

Condensed from Successful Farming

James S. Ayars
University of Illinois

The sweet-clover weevil, has invaded many of the northern states, but most farmers can go on raising sweet clover if they will put into practice some of the approved measures of control.

Sweet clover is one of those crops that mean different things to different farmers. If you're dairying in Wisconsin or Michigan, you may think of it as a first-rate forage crop. If you're farming in Illinois or Iowa, you may regard it principally as a valuable soil-builder. If you're living in North Dakota, you may prize it highly as a source of honey, or value it as excellent nesting cover for upland game birds.

But the sweet-clover *weevil* should mean the same to you as to every other farmer who finds it in his fields, no matter where he lives.

Maybe you don't know what the sweet-clover weevil is. Maybe you haven't gone out some May, June, or July morning and found your new seeding gone, or the leaves of your old stand riddled with crescent-shaped gouges. And maybe you have.

Maybe you have looked over your field for a culprit without finding one. That's not surprising, because the sweet-clover weevil is an elusive critter that comes out of hiding to feed only on dark days or toward dusk.

If you dig around the base of a plant or turn over the ground trash, you may find an ugly little beetle about a quarter inch or less in length that appears dark gray in color and has a well-developed snout that would do credit to a porker. That's the culprit—the sweet-clover weevil, known to scientists as *Sitona cylindricollis*.

As soon as you disturb him, the weevil plays dead, with his feet drawn up close to his hard-shelled body. Then, when he thinks you aren't watching, he sets his legs in motion and scurries for cover. Many a farmer has lost his sweet-clover seeding without knowing the cause.

A native of Europe, the sweet-clover weevil first was discovered

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in the United States at Middlebury, Vermont, about 15 years ago. In the same year it was found in Massachusetts, New York, and Connecticut.

Spreading westward in both the United States and Canada, it was reported established in Illinois by 1940 and a year or two later in Minnesota, North Dakota, and other states. In 1942, it was reported by Dr. Harlow B. Mills, then State Entomologist of Montana, as far west as his Rocky Mountain state.

By 1946, Dr. J. A. Munro, head of the department of entomology, North Dakota Agricultural College, estimated that the sweet-clover acreage in his state was only about 20 percent of what it had been when the weevil arrived. In Illinois, between 1941 and 1946, the acreage of sweet clover decreased from 1,243,000 to 940,000 or about 25 percent.

Competition of other crops during the war years is responsible for some of these acreage decreases, but Doctor Munro believes that in his state, at least, the weevil is responsible for most of them.

Reports on sweet-clover weevil damage during 1947 vary from place to place. In Michigan, where sweet clover is less widely grown than in many other states, Dr. Ray Hutson, state college entomologist, believes that the weevil is so unimportant there in comparison with many other insects that it merits little attention.

Dr. J. T. Medler, University of Wisconsin entomologist, reports that the weevil "apparently did not cause the serious damage reported in previous years." He lays the lack of damage "to the late, cold and rainy season, which allowed initial growth of the plants but delayed emergence of adult weevils."

Over against the relatively good news from Michigan and Wisconsin are gloomier 1947 reports from Illinois, Iowa, and Missouri. Dr. John H. Bigger, Illinois natural-history-survey entomologist, has noted an extension of the areas where damage is occurring, especially in southwestern Illinois counties.

J. C. Hackleman, professor of crops extension at the University of Illinois, estimated that 50 percent of the sweet-clover plantings in the northern half of his state suffered severe losses; and some of them were total failures.

The United States Department of Agriculture reported that the sweet-clover weevil "occurred in large numbers for the first time in Iowa this year" (1947). The insect destroyed sweet clover in the southwestern counties of the state and "was reported as causing considerable damage in northeastern Missouri, and to about 200

acres of sweet-clover in the Minnesota Red River Valley."

Maybe you were one of the lucky ones last year who escaped damage, perhaps thru local weather conditions unfavorable to the borer. But if you live in the northern half of the United States, and want to grow sweet clover, you should be on the lookout for the pest, be able to recognize it and its damage, and know what measures to take in fighting it.

The grayish, adult weevils spend the winter under stubble or ground trash in or near the sweet-clover field. As soon as warm weather comes in spring, they spread rapidly, some of them flying considerable distances to find new food.

The female weevil lays her eggs at the base of a plant, usually in May or June; the eggs hatch in about 14 days, and the young grubs work their way down to the roots. There they feed and transform to pupae that later, usually in August, transform to adults which cause little damage until the following spring.

The weevils, perhaps as many as 25 to 100 per square yard, feed most heavily from the time sweet clover leaves appear until June or July. Some females lay more than 1,000 eggs in two months.

Now in fighting the sweet-clover weevil, you have a choice of one or more of several measures: (1) You can switch, temporarily or in part, to other pasture or soil-building crops. (2) You can change your planting methods and time. (3) You can use insecticides. (4) You can encourage natural enemies of the weevil.

Your own agricultural experiment station probably can give you advice about the substitute plants to use. One of the mixtures Professor Hackleman recommends for seeding in northern Illinois contains—in addition to 6 pounds of sweet clover—1½ pounds of alsike, 3 pounds of red clover, and 3 pounds of timothy. The weevil shows little appetite for legumes other than sweet clover, and the other plants should be safe even though the weevil devours all of its favorite food.

You possibly may be able to raise pure stands of sweet clover, even though the weevil is well established in your community, if you plan carefully. Because the adults prefer to spend the winter in the trash at the base of second-year plants, you can reduce their numbers on your farm by fall-plowing of old fields, Doctor Bigger advises.

You can decrease the possiblity of severe damage to new seedings by planting in fields as far as possible from old stands, because

most of the insects do not fly great distances to find food. Then, even tho you may have weevils in your new seeding, it is possible to have a successful stand if you have planted at a heavier than normal rate. Professor Hackleman recommends 10 to 15 pounds of seed per acre on a well-prepared seedbed.

Doctor Munro has found that, in North Dakota, delaying planting will reduce the damage to new seedings. On one plot, planted May 22, weevils devoured the seedlings almost as fast as they appeared above ground; and by the middle of June less than 5 percent of the seedlings remained. On another plot, planted June 18, the sweet clover was damaged only slightly by weevils, and 90 percent of the seedlings survived.

But because of great differences in weather conditions between various infested areas, delayed planting cannot be recommended as a universal method of fighting the weevil.

Doctor Bigger has found that, in Illinois, earlier-than-usual planting is more effective in dodging weevil damage than is delayed planting. "Our observation," he says, "is that when we can plant in February, if we have a good growing season, even with some weevil feeding, the plants will survive.

"Plant early or late," Doctor Bigger advises, "to take advantage of the life cycle of the insect."

Plowing, discing, harrowing, and other methods used in fighting the weevil vary from place to place as weather conditions vary. But, as Doctor Bigger points out, methods of controlling the weevil by insecticides are nearly the same in all states where they have been used.

As might be expected, the famous DDT has proved to be one of the most effective insecticides tested. However, the search is going on for new and still better materials. In one Illinois natural history survey experiment, Doctor Bigger found little difference between 5 percent DDT and 1 percent benzene hexachloride, both applied at the rate of 20 pounds of dust to the acre.

Doctor Munro obtained best results with 20 to 25 pounds per acre of 5 percent DDT dusted on the plants as soon as weevil damage began—about mid-April in North Dakota. He points out that early dusting kills most of the weevils before they do heavy feeding damage, and prevents poisoning of honeybees when, later, they come to the blossoms.

"Experiments with DDT show considerable promise for control," Doctor Medler of Wisconsin reports.

Insecticide treatment of sweet-

clover fields by ground and airplane equipment still is in the experimental stage, but it already has shown good results.

Two natural enemies of the weevil are worth encouraging. The first is a species of toad with a hearty appetite for weevils. The second is a fungus that apparently helps to keep the weevil in check. As each of these controls is about as difficult to manage as the weevil itself, you are not advised to place much dependence upon them. The only advice offered here is not to kill toads. Despite the old myth, they really don't cause warts, and they may eat large numbers of weevils.

Chemical Weed Control Cuts Labor Costs

Condensed from New Jersey Agriculture

Gilbert H. Ahlgren

For two seasons the New Jersey Experiment Station has grown corn successfully without any cultivation.

This astounding development has been made possible by the new weed killer known as 2,4-D. This chemical, when applied at the rate of 1½ pounds per acre after the corn had been planted and just before the corn seedlings emerged from the soil, kept the weeds in check until the corn was tall enough to shade the ground and handle its own job of weed control.

We tried the chemical on both a heavy and a light soil type. On the heavy soils the corn yields were normal. On the light soils the corn was severely damaged. However most good corn is grown on the heavier types of soil.

Applying the chemical before the crop comes up is what we call "pre-emergence" control. It is now clear that 2,4-D applied in this manner is capable of destroying all weeds that start from seed. This may mean a revolution in the method of destroying weeds at the stage when they do no damage to the crop.

Certain weeds do escape the pre-emergence treatment and these include weeds which grow back from rhizomes or persistent tap roots. Even these are injured to some extent, but not sufficiently to destroy them or to control them

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effectively. Thus Curled Dock, Canada Thistle, Quack Grass and other biennial or perennial weeds are continuing problems which must be attacked by other means.

The control in our plots at New Brunswick has been highly effective for 5 to 6 weeks following pre-emergence spraying. After that period a few weeds have begun to appear, but with growing corn or other row crops which shade sufficiently they never become an important factor.

Our tests also indicate that the 2,4-D has either decomposed or leached out of the heavy soils in a period of 5 to 6 weeks after application.

Before it is possible to decide whether pre-emergence weed control is the answer to cultivating, it is first necessary to determine if cultivation does anything but kill weeds. There is no doubt in my mind that most weeds can be effectively controlled by pre-emergence methods and from the standpoint of weeding there is no necessity of cultivating. Ninety to 95 percent of the experiments conducted on the value of cultivation conclude that the only purpose is to destroy weeds.

We must, however, examine past experience in the light of new methods and techniques. Weeds were controlled in this early work by hand pulling or surface scraping, both techniques undoubtedly having some influence on the soil surface. With a new weapon as 2,4-D there will be no touching of the surface whatsoever and this may make a difference.

It is well known that plants require small quantities of oxygen for normal growth and development. The amount of oxygen is extremely small, being measured as a few parts per million, depending on plant species. It, nevertheless, is an important factor in the absorption by plant roots of nutrients and mineral nutritional elements. All of you are familiar with stunted yellowish corn in low-lying wet areas in corn fields. This is merely evidence of a lack of oxygen preventing the proper nutritional function of the plant.

There is an item of water conservation which must be borne in mind. A hard crusted soil may cause a greater run-off of this precious natural resource than a soil stirred and loosened with normal cultivation. On the other hand, such conservation practices as strip cropping and contouring are succeeding in saving the water. The elimination of cultivation may actually encourage conservation farming, since there will not be any need to cultivate on the contour, a practice to which some farmers object.

There is an increasing fear from soil compaction. Tractors and other heavy equipment continuously pack the soil in running over the fields in most farming

operations. This compaction results in a loss of the satisfactory soil structure, reducing the soil to a less potent crop producing material. To some extent the elimination of cultivation may reduce this hazard.

Another factor causing considerable injury in growing corn is that of root pruning due to improper cultivation. Some say that the first cultivation should be deeper than succeeding cultivations. This is undoubtedly correct from the standpoint of root pruning, but it is a very inconvenient practice. When the first cultivation is deep many small corn seedlings are covered and often lost. The second and third cultivations are often desired to be deep, since this permits throwing the soil up around the corn roots thus covering many of the weeds. There is a tendency for farmers to make these latter cultivations deep for this very purpose and root pruning is inevitable. If weeds were not a factor there would be no need for this practice.

The collection of a surface dust mulch to some extent prevents the plant nutrients in the mulched area from being used by the corn plant. If the roots in the surface area are permanently destroyed there is no opportunity for the absorption of nutrients by them. Thus the surface 1 or 2 inches of cultivated soil is not effective in supplying water or plant nutrients to the crop. This undoubtedly results in weaker plants and lowered productivity.

There are those who say that hilling corn through cultivation reduces root lodging. Actually my observations have been different. Cultivated corn that has been hilled has lodged more severely at New Brunswick than those plots treated with 2,4-D where no cultivation whatsoever was given. It would be my guess that the root pruning, along with hilling, is a factor making corn plants less resistant to wind and storm.

These are some of the factors that must be answered in more detail before we can decide whether or not cultivation does anything but kill weeds. Studies must be conducted on a range of soil types and under different climatic conditions. Certainly, agriculture holds the weapon which makes it possible to study many of these factors in considerable detail without the necessity of removing weeds by pulling or scraping.

Even if it is desired to cultivate once or twice during the season, pre-emergence weed control is bound to have a significant place in the production of such row crops as corn. Many farmers are familiar with the weather hazard where they succeed in planting crops in the spring and then are hampered by wet and rainy

weather which does not permit cultivation for weeks and sometimes months after. This was particularly true over large areas in the midwest in the past season. The control of weeds during this early period of corn development through the use of 2,4-D, as insurance against weather, appears entirely practical.

With the many factors already mentioned there is another of great importance; that of labor and cost of weed control. We estimate that it costs from $4.50 to $5.50 an acre to cultivate corn 3 or 4 times during the season in New Jersey. This is an item of real consideration by every corn grower. The use of 2,4-D for pre-emergence control or otherwise can reduce this cost to as little as $1 to $2 per acre. Low gallonage spraying equipment is definitely on the way. This equipment costs very little and is simple and easy to use. The time seems near at hand when we will plant corn from the front of the tractor and spray the soil surface from the back, thus completing the entire planting and weed control job in a single operation.

There is one other item that is too important for me to skip by lightly. Down through the years there has been a continuous conflict between the haying operations on the farm and corn cultivation. In many cases the haying was delayed while corn cultivation took precedent. As a result corn has contributed as much as any other factor except the weather to the production of low quality hay on many American farms. The control of weeds through the use of 2,4-D as a pre-emergence spray gives every promise that this long conflict between corn cultivation and hay making will soon come to an end and farmers will have more time to take care of their hay.

Built-Up Litter Affects Nutrition

Condensed from the California Farmer

Kennard, Bethke and Chamberlin
Ohio Experiment Station

BUILT-UP floor litter is no longer a new procedure. What is new, however, is that built-up floor litter can serve as a valuable source of special nutritional factors necessary for the production of eggs of good hatchability.

The use of built-up floor litter has become the practice of many poultrymen in recent years, particularly during wartime, when the scarcity of labor and litter material made it necessary in many instances. As a result of this wartime practice it was learned that the use of built-up floor litter proved a good rather than an objectionable procedure.

The principal advantages are the saving of labor and litter material and the better insulation of the floor during cold weather, which aids in keeping the litter dry and in good condition. The expected disadvantages, such as the danger of serious diseases, failed to materialize.

In addition to the other economical advantages of the built-up litter procedure, it has been discovered in four years of experiments that the built-up floor litter becomes an important source of the nutritional factors (including the unidentified animal protein or vitamin factor) necessary for eggs of maximum hatchability.

Each of the four experiments was conducted with 50 range-raised spring-hatched pullet layers to each pen. The birds were confined indoors, trapnested, and the eggs were pedigree-hatched each year.

The primary object of these experiments was to determine the minimum requirements of meat or fish and milk by-products to produce eggs of maximum hatchability when the breeding flock is confined indoors. That the management of the floor litter could influence the need for supplements to the basal ration necessary for the production of eggs of good hatchability was not recognized at the beginning of the experiments in 1943. It was suspected as being a contributing factor during the third experiment and definitely discovered and

Reprinted by permission from California Farmer, March 27, 1948

demonstrated in the fourth test.

In the first experiment with White Leghorns, during which the litter was removed each month, the basal ration with 2.5 percent dried whey was definitely deficient in the nutrients necessary for the production of good hatchability. When the basal ration was supplemented with 2.5 percent dried whey and 2.0 percent meat scraps, the hatchability of eggs was increased 23 percent. For good hatchability, however, it was necessary under the floor litter procedure of this experiment to supplement the basal ration with 2.5 percent dried whey and 4.0 percent meat scraps.

With Rhode Island Reds in the second experiment, comparable hatchability of eggs was secured irrespective of the supplements to the basal ration. These results, contrary to those of the first experiment with White Leghorns, were supposed at the time to be due to a breed difference in the dietary requirements for the production of eggs of good hatchability. To prove or disprove this supposition, both White Leghorns and Rhode Island Reds were included in the third experiment. Again, as in the second experiment, comparable hatchability of eggs was secured from both breeds, regardless of the supplements to the basal ration. It was clearly indicated as being responsible then that the built-up floor litter was for the unexplainable results secured in the second and third experiments.

Consequently, the fourth experiment was designed to secure the hatchability results from the four different rations when the breeders were on built-up wood shavings floor litter in comparison with similar breeders, which received the same rations on wood shavings floor litter removed and renewed each two weeks. Obviously, the results of this experiment with the two different floor litter procedures definitely explained the results of the three previous experiments.

Having failed to employ a ration below the minimum requirements for the production of eggs of good hatchability in the second and third experiments with the breeders on built-up floor litter, two pens of the breeders in the fourth experiment received only the basal ration. This was considered a severe test indeed. Despite the severe deficiency of the basal ration, the breeders which received this ration on built-up floor litter responded with hatchability of their eggs comparable with the other groups, whose rations were adequately supplemented with meat and milk by-products. That the basal ration alone was seriously deficient in the factors essential for the production of hatchable eggs was clearly indicated by the poor

hatchability (33 percent) secured from the pen of breeders on the floor litter removed every two weeks.

Egg production was quite comparable from all of the groups in the four experiments.

The results of these experiments clearly demonstrate that the built-up floor litter was a potent source of the special nutritional factors (including the unidentified animal protein or vitamin factor) necessary for the production of eggs of maximum hatchability with confined breeders.

When Is A Cow Contented?

Condensed from the Missouri Ruralist

Cordell Tindall

WE HAVE come to believe that contented cows give more, and perhaps better, milk. But when is a cow contented? Does she prefer a nice, snappy morning or is she happier to lie in the shade in mid-day summer? Is it the heat or the humidity, to borrow an old phrase, that gets her down? Is she annoyed by drafts thru the barn? Is she a night owl or is she at top production when the sun shines? Would she prefer that her suite be decorated with light or dark paint?

Recently, we were invited to see scientists begin work on answering some of these questions. And these are not matters to be taken too lightly. At the University of Missouri open house was held for visiting research workers and the press at the new psychro-energetic laboratory, a co-operative project of the Missouri College of Agriculture and the U. S. Department of Agriculture.

The new laboratory has been set up at Columbia because of Missouri's central location. This is a dairy-housing-research project, and Missouri's dairy scientists have done some of the outstanding dairy science research in the nation.

The new laboratory is really a barn—but such a barn as you never have seen before. It will accommodate 12 cows, and air conditioning and heating give the scientists absolute control of the climate.

The cows are divided in 2 groups of 6, with pairs in each

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group as nearly alike as could be selected. First, all of the cows will be subjected to the same temperature. Then one group will be kept in warmer temperatures while the other group serves as a check. Later one group will be subjected to cool temperatures. To make it easier, the tests on warmer temperatures will be made during summer, the tests on cool temperatures in winter.

By accurate measurements of the cows' feed requirements, by checking body temperatures and skin temperatures, and by metabolism tests the scientists will be able to determine the effect of temperature on milk production and on the cows.

The cows are stanchioned day and night. They are taken out in an alley for daily weight measurements, but even these alleys are practically the same temperature as the stalls.

All feed, and even the water consumed, will be carefully measured. Keeping all the records required is quite a job.

The new laboratory, or barn, is a marvel in compactness. The metal building is insulated around the walls, over the ceiling and even under the floor. Air-conditioning units control the temperatures.

What does all this mean to the farmer? The scientists are trying to find out what kind of housing we should provide for our farm animals. The work at Columbia is for dairy cattle, work is under way in California on hogs. A new laboratory at Beltsville, Md., will study poultry housing problems.

This is a new approach to an old problem. Instead of adjusting the cow to the environment, the environment will be adjusted to the cow.

Preliminary tests are just getting under way at Columbia. It may be several years before conclusions can be reached from the experiments.

This whole matter of temperature is important in handling farm animals. There probably are a lot of false notions on this subject. Prof. Sam Brody, of the dairy department at the University of Missouri, has comments on basic principles that lead to thought-provoking questions.

For instance, we all have seen fans set up in cattle barns in the summer. At fairs and shows, especially, owners pride themselves in making things comfortable for their prize animals. But are they cooling the cows or the caretakers? Cows do not sweat, so does it cool a cow to blow a breeze over her?

The only animals that sweat, points out Doctor Brody, are humans and jackasses. Horses sweat to a certain extent. We see, then, why mules are used for working in the South.

Anything humans or animals do

involves energy, which means heat. Work of producing milk, eggs, fat, body or muscular work, all require energy and must be given off by the body as heat. When the temperature outside the body is cooler than that of the body, the body can easily give off heat. But as it gets hot the animal has more and more trouble giving off heat. Thus, if the animal cannot give off body heat it must stop work or it will die from "heat stroke." So we can see that hot temperatures may cause more trouble than cooler weather. The cow is a native of cooler parts of the world, she has been moved to warmer climes.

The size of animals has a lot to do with the way they can give off heat. The large animals have less surface for their size. The larger the animal the better it can stand cold weather, and the more trouble it has in warm weather. Little baby chicks need extra heat for brooding, old hens can get by in pretty cold weather.

The color of animals is a factor in body-heat regulation, too. "Would it be silly to paint cows white in summer and black in winter?" asks Doctor Brody.

Sub-Soil Fertilizing

Farmers and soil experts are pretty well agreed that a lack of organic matter and plant food probably had more to do with the poor corn crop last year than the weather did. (See "Soil Hunger Hits Corn Belt," *Farm Journal*, February 1948, page 46.)

An interesting sidelight on this comes from a Missouri experiment. In 1946, the college soils men tried putting large amounts of fertilizer into the subsoils of their test-plots. To do this they used an Oliver TNT plow, which has a sub-soiling piece built back of the plowshare, extending four inches below plowsole depth. A fertilizer hopper on the plow meters the fertilizer into the churned-up sub-soil.

Yields for the first year were good—72 bushels an acre for the plots receiving a generous amount of 8-8-8 fertilizer. But the encouraging part was the 72-bushel yield received again last fall from land given the same treatment. The hot summer cut back most yields, but not on these plots. When the plants sent their roots down deep, the plant food was there.

—Farm Journal

Building Safety into Farm Buildings

Condensed from Agricultural Engineering

C. L. Hamilton

FARM building standards can no longer be considered complete without making adequate provision for safety. They should be safe from injuries to people and safe from unnecessary fires. Many common causes of accidents around buildings have been known for sometime, but the same hazards continue to creep into design through oversight, neglect or indifference. It is unfortunate that accident hazards have been actually built into many farm buildings. The cost of one accident can more than pay for changes in design or construction which may prevent a disaster.

Safety has not advanced as rapidly as other structural improvements in building designs. To cite one example, the detail for building a safe ladder to a hay mow is simple, but year after year agricultural engineers continue to put out farm plans without showing this detail, and year after year farmers continue to build barns with unguarded and hazardous ladders. Recently I went through nearly a hundred barns in northern Illinois, one of the best farming sections in this country, and only one of the barns had a ladder that would be approved by a safety engineer. Most of them were real accident hazards, and distinct inconveniences. Even the few that had stairways were not much better. Many large barns should have stairways, but it is difficult to install a stairway when the space required is not provided in the original plans. We cannot blame farmers for not having these structural safety features in their buildings as long as agricultural leaders continue to omit them from building plans and promotional material.

In any accident prevention program the removal of mechanical hazards is one of the easiest ways to secure results. It should always be given first consideration. It is easier to make a mechanical or structural change than to teach people to change unsafe habits that are deeply entrenched through years of use. Education to develop a safety consciousness is necessary, but by itself it seems to be a long hard road. Frequently it requires a mechanical rear-

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rangement, a guard, or change in design to force people to change unsafe practices.

Safety must be considered in the original plans, in the materials of construction, in details, in lighting. Safe structural features must be developed and included as an integral part of each plan. They must be practical so they are readily accepted as an essential part of the building. Fortunately many safety features can also be distinct conveniences and time savers. Following is a review of a few of the safety features for some of the most important farm buildings.

Barn Hazards. In planning barn improvement it is some of the little things that make routine chores safe and easy. Many farmers spend one-half or more of their time doing farm work in and around barns. A 16-year summary of fatal farm work falls in Kansas shows that about 50 percent of them occurred in or around barns. A special survey in New York last summer revealed that almost one-half of all the farm accidents in the area studied occurred in the barns, and another one-third occurred in the barnyard or in other farm buildings. Defective design or neglected repairs did not cause all these casualties, but directly or indirectly structural improvements could have prevented a large portion of them.

Falls and falling objects cause many farm accidents; so barns should be checked for loose objects or things that lead to falls. High door sills should be removed or the entrance built up so that the sill does not project above the floor level. All floors should be solid, smooth, and continuous. If there must be a change in floor levels, ramps should be used. Plan special storages and orderly arrangements for alleyways or work areas that frequently become obstructed with feed, tools, harness, feed carts, or other obstacles. Don't let farmers work in the dark; see that dangerous corners and work centers are well lighted. Put light switches in convenient locations. Discourage the storage of loose materials overhead and see that forks, scrapers, and other barn equipment are kept in convenient places where they will not fall over. To encourage orderly housekeeping around the barn it is necessary to provide specific storage places for barn equipment.

Loft doors, feed chutes, and ladders are an accident menace in most barns. A well-constructed stairway provided with a hand rail and kept clean provides the safest and easiest passage to hay mows. Doors to the stairway should swing away from the stairwell. It is a bad practice to use stairwells as feed chutes because loose hay or straw make footing uncertain. Separate feed chutes

that are guarded above the loft floor or to the top of the hay in a full mow are desirable in modern barns. When it is necessary to use a ladder, see that it is guarded and extended well above the loft floor. It should also have well-spaced stout rungs that are placed far enough from the wall for secure footing.

The safest and most convenient way to repair, adjust, or oil hay fork carriers is from a well-constructed platform at one end of the barn. Where the large hay doors are some distance from the floor, a good platform should be provided for servicing them. All elevated platforms should be equipped with a stout guard railing and accessible from a stationary ladder. The same treatment should be applied to feed bins or other accessories that involve climbing.

Farm Homes. As you consider the various details and requirements for remodeling and constructing farm homes, you have probably given some consideration to safety because home safety has received more emphasis. The leading cause of accidental death and injuries among farm residents is home accidents. Available records indicate that falls account for about 39 percent of the farm home fatalities, burns 25 percent, firearms 7 percent, poisoning 6 percent, mechanical suffocation 4 percent, and miscellaneous 19 percent. Many special improvements are needed around farm homes to help reduce the high proportion of falls.

Stairs and Stairways. Stairs and steps if correctly built will prevent many falls. The builder should keep in mind that they will be used by old, by young, by those with failing eyesight and by the infirm. Then, too, most farm people have a lot of work to do and they are usually in a hurry. There are probably more unsafe stairways and steps in farm homes than any other single item. Basement and attic stairways are usually the worst safety offenders.

Every stair tread should be equal and at least 10 in. wide. Risers should all be the same height and should not exceed 7¾ in. A fraction of an inch variation in the height of any riser or width of any tread has often caused bad falls. Nor should stairs be too steep; the proper slope is between 30 and 36 deg. Whenever possible, especially in long stairways, a spacious intermediate landing should be provided. It provides a pause that refreshes on the way up, and it also helps to break the worst falls that may occur near the top of the stairway.

Triangular steps or winders are often used to save space and many feel they have an esthetic appeal, but they are dangerous and should be avoided. If it is necessary to use winders they should be laid

out so you have a tread of the normal width at the line of travel about 15 in. out from the inside railing. At their narrowest end the tread should not be less than three-quarters of the normal width, so a reasonable toehold will be provided for children or others who hug the rail. In remodeling work, you will find some old stairs with winders clustered about the newel which cannot be altered. This condition can be made safer by adding a vertical handrail to the newel about 30 in. long and projecting 4 or 5 in. into the stairway. This will force users to walk on the wider portion of the tread and provide a hand hold for the entire turn.

Railings are another essential safety feature often overlooked. They create confidence and lend physical support where most needed. It is fully as important to install a railing for the basement, attic, and exterior steps as for the main stairway. Even front and back porches that are a foot or more above the ground level should have a railing. The severity of falls is not measured by the height of fall.

Consideration should also be given to other details in stair design that may save lives. The top and bottom approach to the stairway is a dangerous spot to watch out for. Never open doors directly down stairs or steps. If the upstairs hall is small, doors to adjoining rooms should open inward, or there should never be less than a 30-inch minimum clearance from all doors at the head and foot of stairways. The first and last step should be clearly defined; a nosing of contrasting color to the tread provides a good marker. A lighter color is commonly recommended for the top and bottom steps of an attic or basement stairway. Provide lights with three-way switches on all stairs so they can be adequately lighted with a minimum of effort on the user's part.

Striking and Tripping Hazards. Don't forget to provide plenty of head room on stairways. The minimum clearance should be about 6 ft. 8 in. Attic and basement stairs are just as important as the main stairway. The fact that they are not used as much is no reason for low headroom, short handrails, or steep design.

Other striking hazards can be eliminated by the use of vertical or horizontal sliding kitchen cabinet doors and rounded corners on counters and built-in furniture. If hinged kitchen cabinet doors are used, narrow doors which limit extension into the working space are desirable. The hardware should be designed and placed so that it will not catch clothing or pinch fingers.

Water pipes, air ducts, and other low-hanging objects which may become striking hazards

should be avoided. If this is impossible, they should be guarded by using bright-colored paint. Doors that open into hallways or other lines of traffic create undesirable striking hazards.

All floors should be without surface irregularities and non-slippery. One-step changes in floor or sidewalk levels are dangerous. In bedroooms locate light switches near each bed as well as near door to avoid stumbling around in the dark. Outlets for night lights wherever there are stair openings are also desirable.

Windows which can be cleaned and equipped with storm sash or screens from the inside eliminate a bad accident hazard, especially where the entire window area cannot be reached by a person standing on the ground or other solid footing.

Closet and Storage Space. The need for closet and storage space at the right place and designed for a specific purpose is gradually being recognized. Many household accidents from cluttered stairways, hallways, and other lines of traffic may be the result of disorderly housekeeping, but the real source of the trouble is usually inadequate storage facilities. In designing new homes or in planning remodeling work a place should be planned for every household item like hats and coats, toys and games, housekeeping equipment, food, linen, toilet articles and medicine, clothing in current use, off-season clothing and equipment, and furniture, trunks, etc., not in immediate use.

Just a closet with four walls and a door is not enough. A closet should be divided with shelves or compartments so there is a definite place for each item. A place for everything and everything in its place is a sound safety motto. Adequate storage space for frequently used articles should be reached by a person of average height standing on the floor. Planning and designing suitable storage at the proper location for all the items used around the ordinary household requires a lot of forethought and ingenuity.

Poor light is a common cause of accidents, besides being annoying and inconvenient. All storage spaces should be designed with adequate natural and artificial light whenever possible. If natural light is not feasible, at least electric lighting to protect persons from striking against protruding objects or groping in the dark should be provided. Closet illumination through the use of an automatic door-operated switch is an added safety feature.

Bathrooms. Bathrooms are supposed to be for cleanliness and comfort, but an amazing number of injuries—even fatal falls—occur in them. In planning a bathroom allow plenty of space between tub, toilet, and washbowl. Select a

tub with a flat bottom. Provide handrails on the wall at the side of the tub. Make them long and run them diagonally or vertically up and down to provide support in a hurry whether sitting or standing and especially when entering or leaving the tub. Use recessed soap containers and provide safe disposal for razor blades. A shower stall and bathroom floor should have a non-slip surface. The bathtub should not be placed under a window which must be opened. Light switches and electrical appliances should be placed out of reach from lavatory or tub.

Farm Fires. Agriculture has a bad fire loss record, so fire prevention in new construction should not be overlooked. No one wants buildings with built-in-fire traps.

Fire prevention should be considered in the spacing and general arrangement of farm buildings. It should be considered in the selection of the materials. Fire-resistant roof coverings are especially desirable. It should be considered in the construction of chimneys and fireplaces, in the installation of stoves and furnaces, and in electrical wiring. Firestopping is another important precaution in building. Fire-resistant interior finishes are also important. Such things as plastered furnace rooms, a double first floor, and a self-closing, metal-covered cellar door help retard fires. The fact that I have only mentioned these fire prevention features rather briefly does not mean that they are not important. Improved building codes have been an important factor in reducing fire losses in urban centers, and there is still a big field for similar improvement in agriculture.

Stretch Your Pasture Season

Condensed from the Farm Journal

Ray Anderson

"Too many farmers work all summer in order to work all winter."

An "intelligently lazy" farmer in northwest Missouri made that observation.

He doesn't put up hay, raise small grain, haul out manure, fuss with farrowing sows, calving cows, or lambing ewes. Chores, as most farmers know them, "just don't exist" on his farm. In fact, he has no out-buildings, except a couple of sheds. He and his brother own a tractor and a truck between them, and he has a lime-spreading truck of his own, but no other heavy machinery.

But he is a money-maker, and he builds up his soil—the easy way.

He pastures the year around.

The man's name is Thelbert Childers. He owns and operates 362 acres in Gentry, and 80 acres in Andrew County, Missouri. The Gentry County land cost him $45 an acre seven years ago.

He has ideas—some original and some gleaned from agricultural colleges. He seldom hires help, but he does hire money. He aims for "simplicity of operation, with profit and soil conservation." He regards "nature as the best partner a farmer can have." He figures that the "way to feed livestock is to feed the soil."

Here is how Childers has handled the grassland where the calves were grazing in the dead of winter. He had 100 head on 80 acres. This 80 was, and still is, half bluegrass (20 years old) and half brome grass, sweet clover, and lespedeza. The tame grass 40 was broken out of sweet clover and lespedeza sod in the late summer of 1945. In September, he broadcast 20 pounds of straight brome grass seed per acre.

In late December of 1945 a mixture of 15 pounds lespedeza and 10 pounds sweet clover seed was broadcast. Neither seeding was harrowed nor disked at any time. It "wintered in."

In the fall of 1946 Childers fertilized the 40 with 4–12–4 fertilizer at the rate of 200 pounds to the acre. He didn't harrow it in. Again in the summer of 1947 he put on 4–12–4 at the rate of 400 pounds to the acre. The tract was

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limed, two tons to the acre, in August, 1945, before the sod was turned.

The grass wasn't pastured until the winter of 1946–47, and then only lightly. Fifteen head were turned in in September, and taken out the following May. During the summer of 1947 Childers stripped off 100 pounds of brome seed to the acre. At 20c a pound it more than paid all costs of seeding, liming, and fertilizing. "That grass is gravy," Childers said.

Cattle were kept off from May until December, when 100 head of 336-pound steer and heifer calves were turned in. They will stay there until early May, 1948, then be moved to summer pasture. Childers had 282 acres of grass in Gentry County last year, including new seeding, and will have 322 acres this year. What he pastures in winter is idle in summer, and vice versa.

Childers estimates from previous experience that next fall his calves, as short yearlings, will average 750 pounds. He figures they won't much more than hold their own through the winter, but will gain 400 pounds or more during the summer. Then they will go to market for slaughter, or as fleshy feeders to a corn feeder.

The calves cost 19.1c a pound, Texas weights, laid down, all expenses paid, including veterinary fees, in Gentry County. Childers prefers thin Texas calves, in good condition. He says "natives" won't do for his system.

From early May this year the brome 40, also the 40 adjoining acres of blugrass, will lie idle until next fall, except for yielding another seed crop. Childers uses the same stripper for brome as for bluegrass.

The calves hadn't had so much as a smell of grain or hay when I saw them. They did have access, of course, to water, salt, and mineral. There isn't a chance they will get any grain, and if they get hay it will be because of a possible several-day blizzard.

Childers has ten tons of hay that he put up four years ago as "blizzard insurance," but he hasn't fed a spear of it—or hadn't by late January, and didn't expect to. No shelter is provided. The calves bed down like deer in the lee of a hill.

Next fall they will have gained 400 pounds each. Figure that gain worth 20c a pound, and that is $80 a head, or $8,000 for the herd from 160 acres of grass one year. That is a return of $50 an acre. Not bad for $45 land! Or figure the gain value conservatively at 15c. That's $37.50 an acre. Still not bad!

Childers even pastures corn—that is, he hogs it down, and later lets the cattle have a go at the stalks. He buys most of his corn for hogs, and he trucks it from a certain locality in southeast Ne-

braska where he says the corn has more feeding value because of richer soil.

He had 80 acres of corn in 1947, but will have only 40 this year. In January 1948, Childers fertilized and seeded 40 acres of stalk ground in one operation. First he mixed grass seed at the per-acre rates of 20 pounds brome, 20 pounds lespedeza, and 12 pounds sweet clover. Then he mixed that with 4–12–4 at the per-acre rate of 500 pounds, and broadcast the whole mixture with the lime spreader attachment on his truck. Once over and he was done. He didn't touch it again.

That's a whale of a lot of seed, 52 pounds to the acre, but Childers gets a whale of a stand, and declares heavy seeding pays big.

Childers is also enthusiastic about brome—says it provides three times more feed than bluegrass, and will smother out any weed. He considers lespedeza essential to a Missouri pasture mixture. He is trying out Ladino for the first time this year. When I saw him in January he was planning to seed Ladino in February on 30 acres seeded to brome, alfalfa, and sweet clover last fall.

He fattens about 1,000 head of hogs a year in nine to ten months with self-feeders out on grass land. He handles corn and other feed by the truckload. The hogs drink at an electrically-heated waterer. They have no shelter, but are bedded. Childers hauls corncobs, a truckload at a time, and dumps them in the field. The shoats sleep on cobs. "If they can keep their bellies dry and their feet warm, cold weather doesn't bother them," Childers told me.

Some years he buys western lambs and puts them on grass. But he had none this year. He buys his milk and eggs. And he has no work horses. He runs a big farm alone, yet finds time for his community.

Maybe some of his "intelligent laziness" wouldn't work for you, but part of it might. Childers farms differently, but he does it easily—and profitably.

Not all of you can have year-round pasture like Thelbert Childers. But most of you can stretch your pasture season by three to six weeks. It will save work—less winter feed to haul to stock, and less manure to haul away. Work both ends of the growing season. Look for crops that will give that "early bite" in the spring before your permanent pastures wake up. Choose crops that can be grazed later into fall.

Hormones for Poultry

Condensed from the American Poultry Journal

E. I. Robertson

HORMONES have created considerable interest among poultrymen following reports that these compounds will increase the growth rate in chicks, maintain higher egg production in old hens, hasten maturity in turkeys, improve the appearance and market grade of broilers, and transform old roosters into capons. Experimental evidence is available to justify some of these claims, but for others, contradictory results have been reported.

Hormones are chemical regulators produced by the ductless or endocrine glands and are distributed to various organs by the blood. Scientific investigation has shown what influence several of these hormones produce in the body. Different hormones serve as checks on one another in their effect on the glands producing them, and each may have more than one function. In this manner, hormones keep the body in balance and cause the appearance and pattern of behavior we think of as normal for that species and sex.

When your heart starts pounding following fright or anger, the acceleration is due to the release of adrenalin from the adrenal glands into the blood stream. The adrenalin increases the heart rate by releasing the "governor" of the heart, which, in turn, pumps more blood to your arms and legs to permit rapid flight or resistance. The adrenals were stimulated by the brain through the nervous system.

The pituitary gland, located at the base of the brain, is the master gland, so to speak, since it regulates the production of many other hormones in other parts of the body. For example, laying hens need a 12–14-hour day for top egg production. The spring flush in egg production is due in part to increased length of day. The active light rays penetrate the eye and stimulate the pituitary gland which influences the ovary to increase egg production. In the same manner, artificial lights during the short days of the fall and winter have been used to increase egg production in hens and to start egg production in turkey breeders.

In a similar manner, the metabolic rate, or rate of living, is regulated by the thyroid glands, lo-

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cated at the base of the neck, through their production of thyroxine. Increased thyroid activity, resulting in more thyroxine in the blood-stream, increases muscular activity, while a reduced output of thyroxine results in reduced exertion and may lead to an increase in body weight by fat deposition.

Two artificial thyroid compounds, opposite in their effects, have been studied with poultry. One of these is iodinated casein, a protein from milk treated with iodine, which has an action in the body similar to thyroxine. Dr. C. W. Turner at the University of Missouri has reported that this compound maintained higher egg production during the summer in yearling hens. The theory of this increase in production is that hens have a decreased thyroxine output which, if replaced by synthetic material, would stimulate greater activity and lessen the fat deposition in the adult hens.

In like manner, increased milk production has been reported from the feeding of iodinated casein to dairy cows, but this greater production of milk resulted from "milking the fat off the cow's back" unless the total digestible nutrients in her feed were increased. Results at Beltsville Research Center, reported at the Cornell Nutrition Conference in 1947, indicate that the total digestible nutrients for the cows should be increased about 25% to prevent a loss in body weight with thyroprotein feeding. At present, dairy breed associations do not recognize records produced by cows fed thyroprotein.

At the same conference, Dr. F. B. Hutt of Cornell University, showed that thyroprotein, in the form of iodinated casein, fed to Leghorn pullets from January to August caused a decrease in egg production for 9 or 10 weeks, after which there was no difference in the production of the control and experimental groups. In the opinion of Dr. Hutt, the improvement in egg production reported by Dr. Turner was not sufficiently greater to indicate any beneficial effects of thyroprotein feeding, The Cornell experiments, conducted with about 400 pullets, showed no beneficial effects from feeding iodinated casein.

Present evidence does not warrant the use of thyroprotein for improving egg production. Nor has the result of thyroprotein fed to growing chicks been sufficiently studied to indicate definite improvement in the growth rate, though a report in a farm magazine two years ago, by a Missouri broiler grower, indicated improved growth and feathering when iodinated casein was fed to young birds. More recently, investigators at the University of Georgia have reported greater growth and more uniformity of size in male broilers at 12 weeks of age when thyropro-

tein was included in the ration at the level of 10 grams in 100 lbs. of feed.

Several investigators have shown that thiouracil—a compound that blocks the action of the thyroid gland—caused increased fat deposition in swine, sheep and poultry. However, chicks fed this compound from the time they were one day old were stunted, their feathers failed to develop normally, and chick down was retained longer than usual. In pigs, similar stunting effects have been noted. While body weight of the pigs increased, the increase was caused by fat rather than increase in skeletal or muscular development. Dr. S. A. Asdell of Cornell University has reported that thiouracil-fed pigs had a thicker skin and more watery fat, suggesting the edema associated with hypo-thyroidism (low thyroid activity).

While early feeding of thiouracil stunts growth, the use of this compound later in the growing period has increased body weight and improved market appearance in broilers and roasters. Except for experimental work, however, its use in not permitted at the present time.

The naturally occurring estrogenic (female) hormones produce the physiological changes associated with maturity in pullets. These hormones cause the oviduct to develop rapidly, increase the deposition of fat under the skin, in the abdomen, within the muscle fibers, and in the blood of the pullet as she nears sexual maturity. This layer of fat under the skin greatly improves the appearance and market grades of pullets and accounts for their higher quotations on the market. However, the natural occurring estrogens produced by the ovary are too expensive for use in improving the market grades of poultry.

Organic chemists have found a compound whose derivatives produce effects similar to the natural estrogens when injected. One of these compounds, diethylstilbestrol, was used by Dr. F. W. Lorenz at the University of California and many other investigators. This compound, when injected into cockerels and old males, was found to feminize them, and roosters stopped crowing, began to "sing", and took on the characteristics associated with pullets in egg production. For instance, the pelvic bones of the male birds began to spread, the vent became enlarged and moist like that of a laying pullet, and the abdomen and skin became soft and pliable, rivaling the "handling qualities" of a hen in egg production. Likewise, the feather pattern changed when female-shaped feathers began to grow.

Diethylstilbestrol, however, is far more effective when injected than when given in the feed. Since

the beneficial effects of this compound depend upon its concentration in the blood stream, the best way of applying it is to fuse the compound into pellets which delay its absorption.

The use of pellets of diethylstilbestrol for fattening poultry is permitted by the Food and Drug Administration, and several commercial companies have made these pellets available with an implanter or metal band for implanting them under the skin of broilers and old males. A single pellet weighing 15 milligrams is sufficient to produce the maximum feminization in a broiler within a 4-week fattening period. Larger birds, however, may require more than one pellet.

Several other compounds similar to diethylstilbestrol have been found to be effective when given in the feed. Work of Dr. R. George Jaap, formerly of Oklahoma Experimental Station and now at the Ohio State University, has shown that about 40 milligrams of dianisylhexene in a pound of feed produces a maximum response within 2-weeks time, though the response is not so great as produced by a pellet implant of diethylstilbestrol after 4 or more weeks. Dr. Rollin H. Thayer, at Oklahoma Experiment Station, has published later reports on the use of synthetic estrogens in fattening poultry.

The sale of estrogenic substances in the feed is not permitted by the Food and Drug Administration. It is probable that this restriction will remain in force until evidence is available to show that the meat of poultry so fed will not produce any undesirable effects in the consumer. Commercial distributors of diethylstilbestrol recommend that pellets be implanted in the upper neck region of the bird as this part would be discarded when the market bird is dressed.

Compounds that have been shown to be effective in improving the market grades of poultry are diethylstilbestrol, dienestrol, diacetate, dianisylhexene, dianisylhexane and triphenylchloroethylene.

Reducing Chore Labor on Dairy Farms

Condensed from the Guernsey Breeders Journal

B. R. Bookhout
Michigan State College

CHORE work makes up more than half of the total yearly work on dairy farms. The return that a farmer gets for his labor depends to a considerable extent on the effectiveness of his daily work. What are the important chore jobs? What are the differences in labor requirements on different farms? What are the causes of these differences? How can the job be improved to give more effective use of labor? To answer these and other questions, a detailed study of chore work on dairy farms was started in the spring of 1946.

The chore time on 10 selected dairy farms during the winter season averaged about six hours a day. Work with dairy cows made up 86 percent of the total chore work. The other 14 percent was distributed as follows: five percent to young stock and bull, four percent to poultry, two percent to hogs, one percent to horses, and two percent to miscellaneous chore work.

To study further the daily chore work, the time spent with dairy cows was broken down into the following jobs: getting cows in and out of barn; cleaning mangers and feeding the cows; milking; caring for milk; caring for utensils, and cleaning stables and bedding the cows. The average daily time requirements for each of these jobs is shown in Table 1. The jobs are ranked from high to low according to the time taken.

Table 1.—Distribution of chore work with dairy cows on 10 central Michigan farms, 1946.

Job	*Average time per day*	*Per cent of total*
Milking	2 hrs. 27 min.	48
Cleaning mangers and feeding cows	48 min.	16
Caring for utensils	42 min.	13
Cleaning stables and bedding cows	40 min.	13
Caring for milk	18 min.	6
Getting cows in and out of barn	13 min.	4
Total	5 hrs. 8 min.	100

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The fact that milking comprised 48 percent of the time spent with dairy cows indicates the importance of reducing the time on this job. The three possible approaches to the problem of reducing the milking time are as follows: (1) Improving stable layout; (2) improving the equipment, and (3) improving the work methods.

An individual farmer usually makes use of a stable "as is" because of the expense of changing to a more convenient layout. On many farms, however, there is a great chance of improving the stable by minor changes such as moving a door, relocating an alley or changing a hay chute. It is interesting to note that more than 60 percent of the dairy work takes place behind the dairy cow, while only about 15 percent takes place in front of the cow. Thus, in planning a new or in remodeling an old stable, the relative importance of the location of the work should be considered before deciding on the stable arrangement. Some dairymen have adopted the pen-type barn when building new or remodeling old barns. This type of barn has both advantages and disadvantages which should be investigated before constructing the barn. Some farmers have been successful in the use of the pen-type barn, while others have not. It should be pointed out that the pen-type barn affects the jobs of feeding the cows and cleaning out the manure more than the jobs associated with milking.

The second means of reducing the milking labor is to use more efficient equipment. The farms included in this study had standard commercial milking machines. Further improvement in milking machines and in carts for moving milk and utensils will reduce the milking time.

The third and perhaps the most important means of reducing milking time is improvement of the methods of doing the work. To aid in the study of time reduction, the job of milking was broken down into eight operations.

The total milking time per cow per day on these 10 farms ranged from about seven minutes to 22 minutes. This was a range of from 56 percent of the average to 165 percent of the average of the 10 farms. Without any reference to the figures on the individual records, several important ideas can be pointed out.

1. *Machine Milking*—The time spent in milking with the machine was generally the most important part of the job of milking. This time ranged from about three to eight minutes per cow per day. The variation was due partly to the difference in rate of movement of the machine operator and partly to the organization of the work. The better operators kept the units together, milked the cows in order, and had the work

organized so that there was a minimum of waste motion.

2. *Hand Milking and Stripping*—The lowest time requirements were on farms where hand milking and stripping had been eliminated. On three of the farms, one or two cows were usually milked by hand even though most of the herd was milked with the machine. On one farm the time spent in hand stripping was nearly twice as great as the time spent in handling the machine.

3. *Caring for Utensils*—The time spent in preparing the utensils before milking and in caring for them after milking varied considerably. There is no clearcut relationship, but the lower records of time spent on these operations were on farms where the milkhouse was near the barn and was well-equipped for washing and storing the equipment.

4. *Caring for the Milk*—The variation in time for caring for the milk was caused chiefly by the location of the milkhouse and by the type of cooler used. A milkhouse near the barn reduced the time in carrying the milk from the barn. An electric cooler or a tank cooled with water took a minimum of the operator's time because the cans were merely put in the cooler and no further attention was needed. Some form of agitator or spray aerator cooler took more of the operator's time because the cooler had to be changed from can to can during the cooling process.

5. *Idle Time*—The time spent waiting for the machine to complete the milking varied from zero to 3.77 minutes per cow per day. The amount of waiting can be taken as an indication of the organization of the work and the operation of the milking unit. On the farms with the low-total milking times the work was organized so that there was very little waiting.

Another way of showing the differences in the work methods between farms is to follow the machine instead of the operator.

The time the machine was on the cow was recorded from the time all the teat cups were in place until all the teat cups were removed. Any time spent in "machine stripping" was included in the time the machine was on the cows.

The average machine time per cow ranged from a low of 4.8 minutes to a high of 11.5 minutes. In other words, the farmer with the low average time per cow would be able to milk more than two cows, while the farmer with the high average time per cow was milking one cow. This indicates that there is a great opportunity to reduce the time spent in milking by training the cows to milk rapidly. Experimental evidence has shown that with the

proper technique cows can be milked with about three minutes of machine time per cow. If the farmers in this study could reduce their machine time to that level, the milking time would be one-third less on the farm with the low record. On the farm with the high record the milking time would be only a little over one-fourth of the present time if the goal of three-minute milking was reached.

Recommendations for Reducing Chore Labor

1. Arrange buildings for convenience.
   a. Change building layout to reduce the work to be done.
   b. Locate feed storage and chutes for convenience.
   c. Locate doors, gates, and electric switches where they are needed.
   d. Locate the milkhouse as near stable as possible.
2. Make more effective use of equipment.
   a. Keep equipment in good repair.
   b. Store tools in handy places.
   c. Substitute equipment for hand work where possible.
   d. Use carts for transporting heavy loads.
3. Improve work methods.
   a. Practice "managed" or "three-minute" milking.
   b. Milk cows in order and keep milker units together.
   c. Eliminate all unnecessary operations.
   d. Eliminate back-tracking and waste motion.

Higher Yields of Legume Seeds

Condensed from the Ohio Farmer

E. W. McMunn

How would you like to harvest a red clover seed crop that made 12 bushels per acre? Alsike clover at the rate of 20 bushels? Or alfalfa at the rate of 40 bushels per acre? Fantastic yields, aren't they? Yes, they are, when we consider that red clover seed in Ohio now averages only about nine-tenths of one bushel per acre and alsike yields only about 1.1 bushels.

And yet, red clover could produce 12 bushels of seed per acre and alsike 20 bushels with a perfect stand and every flower properly fertilized. This is the estimate of specialists at the new Legume Seed Research Laboratory at Columbus. These men are now starting a project that may help Ohio legume seed growers get their yields up a lot nearer those maximum figures.

It's probably true that we have made more progress in almost every other line of crops than we have in the production of legume seeds. We have developed new corn hybrids and they have boosted yields far above oldtime averages. New varieties of small grains have resulted in larger yields and better quality. But little work has been done to find out how to get larger and more profitable seed yields from our common legumes.

Here's where the Legume Seed Research Laboratory comes into the picture. There are now two of these in the country—one in Utah to study alfalfa seed production and the other at Columbus to work on red and alsike seed production.

There wasn't much fanfare when the laboratory was set up at 4299 North High Street in Columbus last April. Anyone could drive past the old house in which the laboratory is located and never dream that here is located a research project that will affect legume seed producers and farmers in every state in the entire Midwest.

There's an enormous demand for clover seed. Almost every meadow mixture has some kind of clover in it. Clovers are among the best and cheapest sources of proteins for the livestock farmer. It's the purpose of this laboratory to

Reprinted by permission from the Ohio Farmer, Cleveland, Ohio, March 6, 1948

find ways to increase the supplies of legume seeds.

Work of the Legume Seed Research Laboratory at Columbus is divided into three divisions. One of these divisions is studying ways to breed plants best adapted to the humid section of the United States. This division is headed by John G. Dean, with Russell L. Secrest as his assistant. These men will try to find new strains and varieties that will be more profitable forage and seed producers.

Another of the divisions is studying how to control insects that injure legume crops. Here is a field where much work is yet to be done. For instance, the clover root borer is causing a lot of damage to clover in Ohio and other states. Sometimes the plants are killed outright by this insect. Controls for this and other insect pests will be sought by Ray T. Everly who heads this department and Quinton A. Hare, his assistant.

The third division of the laboratory is set up to study insect pollination and its effect on legume seed production. Alan W. Woodrow is head of this division, with W. E. Dunham spending three-quarters of his time here and the balance teaching at Ohio State University.

It's already known that insects, especially honey bees, play a great part in legume seed production. The common Ohio clovers such as red, alsike, Dutch and Ladino are practically self-sterile. This means that they are dependent upon insects for cross-pollination to insure a seed set.

And, for a perfect job of polination a lot of insects are required. For instance, a normal stand of red clover will have 216 million florets per acre and each of these must be visited by an insect if pollination is to take place. The florets are in groups of 80 to 140 and make up the blossom heads on the clover plant. Unless a floret is pollinated at the right time it will not produce its individual seed.

The Columbus research workers already have a number of studies under way. Last summer they worked with some farmers in the Columbus area in collecting information and making field studies. Of course, it is true that many of these studies must extend over a period of years. Improved varieties are not developed in a single year. It takes time to find the best control for a particular insect pest. And, it will also take years to find out how to get the best possible pollination.

There's a lot of research work yet to be done in the field of legume seed production. Not only Ohio, but other states as well will look to this institution for the answers.

Three-year Rotation May Deplete Soil

Condensed from Wallaces' Farmer and Iowa Homestead

ARE we slowly losing our soils? Maybe our farms are paid for, but is the nitrogen in the soil—which is the measure of the soil's productivity—gradually getting away from us?

At a farmers' night school in a central Iowa county, two soil conservation specialists presented some figures which made the men sit up and rub their eyes.

Even with a three-year rotation of corn, oats and clover, which is generally considered as the ultimate in soil building, fertility is not being maintained.

That was how the figures added up. Soil conservation men used a method which was worked out some years ago at the Ohio and Missouri experiment stations.

As stated, fertility of a soil is pretty largely determined by its nitrogen content. It is rather simple to restore the phosphate and potash that have been used up by a crop. To restore the nitrogen is more expensive.

You can calculate roughly the per cent of change in total soil nitrogen caused by various crops.

Corn and oats, and even soybeans, take nitrogen out of the soil. So they are given minus marks of 2, 1 and 0.5 per cent respectively.

Red clover and alfalfa add nitrogen. They get plus marks of 2 and 2.5 per cent, respectively. Manure gets a plus of 0.15 for each ton used. Fertilizer in the form of 0–20–0 gets a plus of 0.15 per 100 pounds.

Crop residues rate high in value. Corn stalks, oat straw or second-crop clover each adds 0.25 of a point—just the same as a crop of timothy plowed under.

Some concrete examples to demonstrate to the group what our common rotations are doing were worked out from these figures. Here's the one for the three-year rotation:

Nitrogen Losses (Minus)

	Pct.
Corn	2.00
Oats	1.00
Total	3.00
Erosion losses, in two years	0.60
Total loss in three years	3.60

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Nitrogen Gains (Plus)

	Pct.
Red clover	2.00
Second crop, if not removed	0.25
Corn stalks (one year)	0.25
Oat straw, one year	0.25
Total	2.75
Six tons of manure	0.90
Total	3.65

The soil fertility account in the above sample is balanced. But the balance is secured by the addition of six tons per acre of manure.

Even with the best of soil conserving practices (including contouring), you are likely to lose 0.30 of 1 per cent of top soil each year from erosion. It is this minimum figure which is used above.

The average rotation, as revealed from AAA data, is more nearly this: Corn three years, oats one year, clover one year. Average erosion loss, on up-and-downhill farming, is nearer 1 per cent per year. This adds up to 11 per cent lost to crops and erosion.

Red clover and crop residues put back 3 per cent. That would mean a net loss of 8 per cent for the five-year period, or an average of 1.8 per cent per year.

That doesn't mean that the soils will be entirely depleted in 60 years, for one just keeps taking away 1.6 per cent from what is left each year.

(Try dividing a cake by each taking half of what is left, in turn. It's never entirely gone, but the pieces soon get pretty small.)

Legumes, fertilizer and livestock can balance the soil account.

Are We Headed For Atomic Farming?

Condensed from the Progressive Farmer

Robert Leigh
Asst. Director, Research Interpretation Council, API

If we are to judge from the "atomic farming" conference in Auburn, held in December, it looks as though modern-day scientists are going to outdo Luther Burbank, Cyrus McCormick, and Eli Whitney.

Most of the discoveries presented are still in the field of possibility rather than probability. But all of the 300 scientists were bubbling over with optimism.

The scientists talked about isotopes, atoms, radioactive elements, etc. An atom, is the smallest unit of a chemical element. Atoms make up all material things in the world—you and me, the soil, plants, and animals. Chemical and life processes take place as atoms move around. So it is very important to all of us to know more about how atoms behave in animals and plants.

The scientists at the atomic plant in Oak Ridge know how to make man-made or synthetic atoms which behave just like normal atoms in animals and plants. But they are radioactive—that is, they give off rays. These man-made atoms, called radioisotopes, can be followed or traced as chemical and life processes take place in plants and animals. It is almost as if each atom were a tiny spy and had a tiny radio transmitter to tell us where it is and what it is doing.

With these man-made atoms the scientists can trace the uptake of crops from the soil of elements like phosphorus, potassium, iron, and so forth. They hope that such studies will lead to an increase in the efficiency of fertilizers and soils.

Dr. S. B. Hendricks, of the USDA Experiment Station, Beltsville, Md., told about using radioactive phosphorus on the phosphate fertilizer problems which are being carried out on cotton and tobacco in North Carolina and on potatoes in Maine and Connecticut.

Periodic checks of crops on different type soils show what parts of the plants are receiving the radioactive phosphorus and how much good it is doing.

Dr. Hendricks said that Ala-

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bama farmers spent about $10,000,000 one year for an adequate phosphate program. "Here as elsewhere in the Southeast the agronomist knows that only about 15 per cent of the applied phosphate is utilized the year it is applied to a crop," he said. "One naturally wonders about the remaining 85 percent, its later availability and loss through erosion."

Radioactive isotopes of phosphorus and iron which were shipped from Oak Ridge have been used by Dr. Orlin Buddulph of Washington State College, Pullman, Wash., in his work to cure common diseases in plants.

Dr. Buddulph traced the tying up of iron in the roots of plants in the presence of an abundance of phosphorus. He reported rapid uptake of iron in absence of phosphorus.

"Iron is an agent in the formation of green coloring matter in plants," he explained. "When that is blocked off the plant is unable to make its food, and it dies."

Dr. M. D. Thomas of the American Smelting Company, Salt Lake, gave information on the use of sulphur compounds. He said one type of sulphur compound helps tomatoes while another type slows up growth.

One afternoon of the three-day conference was devoted to a demonstration of a typical tracer experiment conducted by Dr. Ralph T. Overman, chief chemist, U. S. Atomic Energy Commission, Oak Ridge. Dr. Overman injected radioactive iodine into a dog and followed its course in the dog's body with the use of a Geiger counter. The radioactive iodine gave off rays which were picked up by the counter. The iodine concentrated in the dog's thyroid gland. Dr. Overman also injected a solution of radioactive sodium into a rabbit and traced its course in the body. He placed a cut flower in a solution of sodium to show how this element concentrated in the petals of the flower.

In the field of nutrition and animal husbandry, Dr. George K. Davis, Animal Husbandry Department, University of Florida, talked on the relation of nutrition to development of disease. He told how poorly cattle had fared on pasture in the Everglades section of Florida where grasses were deficient in copper.

One cannot predict future value to agriculture of the studies on plants and animals which isotopes make possible. William W. Waymack, member of the Atomic Energy Commission, who is well known for his interests and activities connected with agriculture, had this to say:

"Suppose that within 10 or 20 years, directly or indirectly as a result of our atomic energy program, the total farm production of the United States were increased by 1

per cent. That is not a prediction, particularly as to time. But it is not a fantastic idea. On the basis of 1946 quantities and prices, the value of a 1 percent increase would be $240,000,000 a year. In 10 years it would amount to $2,400,000,000. In other words, it would be almost exactly what the United States spent on its whole atomic energy undertaking during war."

Alabama Polytechnic Institute sponsored the conference in cooperation with the Oak Ridge Institute of Nuclear Studies. Dr. Russell S. Poor, dean of the Graduate School and director of the Auburn Research Foundation, was conference chairman.

School for Horses

Condensed from The National Horseman

Helen Colton

FOUR-LEGGED equine actors, no less than two-legged human ones, have to take dramatic lessons before they can act in the movies. Most of Hollywood's acting horses are put through their drama paces at Jack "Swede" Lindell's school for horses in San Fernando Valley, an "Equine Academy of Dramatic Arts" that has no equal in turning out star performers.

Almost everyone of the horses Swede has trained during the five or six years he's been a drama coach, like Smoky, Flicka, Thunderhead, and Banner, play star parts.

Entrance requirements into the school, which is run at the Clarence (Fat) Jones Stables, are snooty. Since each pupil gets Swede's personal tutoring and he can handle only about fifteen at a time, he admits only registered animals.

The curriculum is an easy one. All a pupil here has to learn is to register the emotions of surprise, fear, interest, rage, affection, and to charge forward, walk forward, and rear up on hind legs.

It's an acknowledged fact that acting is done almost entirely with the eyes, which mirror our emotions. This is just as true of animals as it is of humans, and so Swede has to evoke expressions in the eyes of his horses which are most closely akin to the expres-

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sions which convey certain emotions in human eyes. It's all done by hand signals and body movements.

Told to register fear, you open your eyes wide and stare. Swede gets a horse to do the same thing by making what might be called a threatening gesture with a buggy whip or a lash whip. A sudden unexpected lunge of his body brings a look of surprise to the horse's face.

Sensitive, delicate creatures, twenty minutes of training at a time is all they get. A deed well done wins them the reward of a bite of carrot. Most of the time they loaf around the barn or the corral. They're fed on a diet of oats, hay, and corn. The feed bag goes on twice a day, at seven in the morning and seven at night. They get an hour's exercise a day, either with a rider or at the end of a long line.

Occasionally Swede has to teach a pupil an extra-curricular trick for a specific part. Smoky, the hero of Will James' horse story, had to be taught to grab hold of a man's body and pull him gently, for a scene where he discovers a fellow with a broken leg out on the plains, without human help nearby, and saves his life by pulling him back to camp.

For the first lessons, Swede used a dummy for the man's body. Then later, so Smoky could get used to the weight of a real person, he pulled one of Swede's five assistants around, and thus was letter-perfect when he did it for the camera.

Recently, for "Green Grass of Wyoming," Swede taught a mare, Crown Jewel, and a stallion, Thunderhead, to do liberty jumps for a scene in which the two horses, escape the corral and go off to the mountain Swede started them low and, over several weeks, increased the height of the hurdle until they were jumping six feet.

This Thunderhead trained for "Green Grass," incidentally, is not the same Thunderhead who starred in films a few years ago, notably in "Thunderhead, Son of Flicka." A has-been, the original Thunderhead was sold, along with his contemporaries, Smoky and Flicka, to a traveling show and is now on exhibit at the Atlantic City (N. J.) Steel Pier.

The Hollywood caste system works overtime when it comes to star-horses, which sometimes have as many as four doubles, far more than human actors ever get. One double may be used for running or trotting, another for jumping, one to look pretty, and one to nuzzle. Crown Jewel, Thunderhead, and Sundown, which do not include trotting gracefully among their accomplishments, remained at Swede's school while doubles trotted for them on location in Ohio.

By giving their animal actors

such extensive training beforehand, Twentieth Century-Fox, which makes most of the horse movies, figure they're saving about $100,000 per film. They learned their expensive lesson with an untrained horse in "My Friend Flicka." On location, the original Flicka got temperamental, refused to show up on the set and wandered off into the mountains, holding up shooting. When they did get her in front of the camera, she was just a bad actress. After a week's shooting, they had to scrap costly Technicolor footage and start anew with a more docile star. Since then, Twentieth Century-Fox will not make a horse picture unless the leading animals have been trained extensively beforehand.

A "star" horse is worth about $100 a week to a movie company while he's in training for a role, or is being held to "match up" to another horse for doubling, and $200 or $250 a week during actual shooting. A "supporting" horse is apt to get $75 a week in training and $150 in production.

Along with Swede Lindell's horse school, the Fat Jones' Stable, where Swede has his headquarters, keeps approximately 150 horses which are just good steady performers but not worthy of being groomed for stardom. These are the horses which usually carry the sheriff's posse "up the pass" to head off the bad guys. An equine spear-carrier or "posse-carrier" is worth $35 to $50 a week in rental fees.

The day that one of his star horses is on call from a studio, Swede drives him to the studio and stays with the animal all day, giving acting cues out of camera range. Quite often, he has to chaperone his players to out-of-town locations. A few months ago he flew several trained horses up to Kanab, Utah, for location shooting.

Swede usually starts training an animal for a movie role about three months before production. Upon planning a film that will need horse actors, a studio sends him its casting requirements. If Swede doesn't have the kind of animal they need, he goes out and buys it. Stallions are called for most often since they're the smartest, most spirited, and most photogenic.

Although Smoky rates pretty high as an intelligent animal in Swede's opinion, he still remembers Rex, the King of Wild Horses, daring hero of silent movies, as the smartest animal he ever handled. Swede himself discovered Rex while talent scouting through the western horse country. A wild, coal-black stallion, he was the *Phi Beta Kappa* of horse intelligence whenever he could be brought under control long enough to take instruction. Having handled the King of Wild Horses, any animal

Swede handles now is a breeze by comparison.

But nothing connected with horses could ever be hard or unpleasant for Jack Lindell. When he was a kid reading western pulp stories in Sweden, he ate, slept, and lived horses. At sixteen he came to America on his own and headed straight for Texas where he became a cowboy and got to live with the horses he loved so well.

After a few years he went to California, did some trick riding with the Al G. Barnes Circus, and then drifted into stunting and riding in pictures. He began to train horses for the movies in 1922, when he was twenty-five, and is now considered the top man in his field.

Horsemen around Hollywood still talk about the snarling, vicious fight-to-the-death between Thunderhead and the wild Albino in "Thunderhead, Son of Flicka" as the most magnificent horse scene ever filmed. Swede, who trained the horses for the fight, says that, oddly enough, it took very little training. "Let two stallions out loose together and they just naturally start scrapping. And besides," he grins, "you know those movie cameramen with their trick photography."

Fence Posts From Soft Woods

Condensed from The Eastern Breeder

FENCING plays an important part in a successful livestock operation. With durable wood going into other, more profitable, channels, many farm owners are faced today with the necessity of using non-durable woods for fence posts and replacing them every 12 to 18 months at a high cost in money, labor, and annoyance.

Fortunately, however, there is a practical answer to the problem developed by experienced forestry engineers, the Department of Agriculture, and scientists who have contrived methods and formulas of treating non-durable woods to give them lasting qualities inherent in natural durable wood.

These developments, if followed, will result in considerable savings, not only in money, but also in time.

An idea of the scope of these advantages can be obtained by using

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the State of Virginia as a typical example. According to the state extension service, the average Virginia county now sets approximately 100,000 fence posts per year.

Pressure treated sawed pine posts ($4'' \times 4'' \times 7'$) in the vicinity of commercial plants at Norfolk cost approximately 90 cents each. Yet the cost of treating 4″ posts with pentachlorphenol or "penta" is estimated at only 45 cents by the extension service, IF fence post treatments, as outlined by the department, are followed.

The most practical method of preserving fence posts today is the cold-soak treatment, using either "penta" or creosote. Although both are endorsed by the forest products laboratory, creosote, "like the old gray mare, ain't what she used to be" according to Wilbur O'Byrne, Virginia Extension Forester, who like many other extension men, prefers "penta." But either adds enough life to the post to make treatment a good investment.

Because of the human elements involved, definite estimates on the life of treated posts, are out of the question, but it is reasonably safe to say that pine posts, treated according to instructions, will last as long as the wire fence that goes on them; 20 to 25 years. This brings the yearly cost to a very reasonable figure.

Many farmers favor creosote, largely because they have heard more about it. The creosote should be *coal-tar* creosote from a reliable manufacturer. Creosote can be diluted 50–50 with used crank case oil. However, used oil often costs as much as domestic fuel oil, is messy to handle, and carries troublesome sludge.

Pentachlorphenol is a made-to-order preservative which has come on the market recently. Having a definite chemical formula, it is more dependable than creosote, which may mean almost anything. It is available in several concentrations at prices which make the recommended strength come to around 30 cents per gallon. Between one-third and one-half gallon of the solution is absorbed by a $4'' \times 7'$ pine post. Fuel oil costs about 10 cents and is available almost everywhere.

Where only a few posts are needed, or it is desired to treat long pieces, such as arbor poles, sills, etc., one of the standard methods of applying zinc chloride may serve better. In addition to less equipment, there is no left-over preservative.

Ideal equipment for the cold-soak method would be:

(1) Two cylindrical tanks, large enough to make an efficient operation and 8 feet tall. (A tank 55 inches in diameter will handle about 65 posts per charge, one 48 inches in diameter about 45 posts, and one 24 inches about 13 posts.)

If the tanks are set six or seven feet in the ground, the posts can be handled more easily.

(2) A small pump to transfer the preservative from tank to tank.

(3) A metal basket and hoist to save handling individual posts.

(4) A perforated plate to keep the posts submerged during treatment.

(5) Neoprene gloves to protect the skin from the preservative.

A vertical tank has one advantage: Butts-down treatment gives deeper penetration at the bottom where it is most needed. However, a horizontal tank may be so much cheaper that it will make up for a lot of excess preservative. Old tanks can often be obtained from junk yards or oil companies which, with some alterations, can be used and would cost less than new tanks.

The pump would make it possible to let the posts drip before removing them from the tank. Neoprene gloves can be purchased through any drug supply house.

On a farm job, smaller tanks may be used—even one that will take only one end of the post at a time. Wooden tanks of 2 inch tongue and grooved planks can be constructed for as little as $10.00.

Equipping the tanks with steam coils would make the plant suitable for the hot-cold bath process as well. This is quicker than cold-soaking and might fit well with a community or commercial cannery, sawmill, or other source of steam heat. It would also make it possible to treat posts in cold weather. Cold-soak treatment is successful only when the temperature is 80° F. or more.

Pine is probably the best all round species. It is usually available in quantity and is easy to handle. Other recommended species are red, black, and scarlet oaks, provided they have a high sapwood content. These all take satisfactory treatment with a relatively short soaking period.

Species which take treatment but require a longer soaking period to get good absorption, are black cherry, elm, hickory, and white oak.

Maple, birch, aspen, and willow absorb the preservative through the end grain but show very little penetration elsewhere—they are not recommended.

Posts 4 inches in diameter at the small end are recommended; smaller ones may not have adequate strength and larger ones will take more preservative. The usual length is 7 feet, but some farmers say 6 foot posts are long enough for most of their fencing. Corner and end posts should be larger, and it is recommended that all cutting and boring for braces be done before treatment, so no untreated wood will be exposed.

Round posts are more satisfactory than split or sawed posts. Only sapwood takes treatment

well and splitting exposes some heart wood. All bark—both outer and inner—*must be removed* and the posts given *not less than* four months of good drying weather to season. Wood seasons slowly during fall and winter so should be given longer treating time if cut then. Posts should be open-piled for seasoning a foot or more off the ground. If held longer than is necessary to season, untreated posts should be stored under cover to guard against decay.

A tobacco barn would make an ideal place for seasoning posts in cold weather and could be used to approximate the hot-cold bath method.

With creosote at 50 cents per gallon, "penta" at $2 per gallon for the 1 to 10 concentrate, and No. 2 fuel oil at 10 cents per gallon, there should be little difference in cost. Not counting cost of equipment and left-over preservative (which may be saved and used later), the cost of treating 100 posts 4″ in diameter and 7′ long should be approximately as shown in the accompanying table.

Item	*Cash Contributed*	
5 gal. "penta" (1–10 concentrate) @ $2.00	$10.00	
50 gal. No. 2 fuel oil @ 10c.	5.00	
Cutting, peeling and hauling		$15.00
Stumpage allowance 10c. each		10.00
Labor and incidentals around plant		5.00
Total costs (100 posts)	$15.00	$30.00
Total cost per post	.15	.30
Total overall cost per post		.45

Extension men are urging farmers to band together in cooperative groups and set up a centralized depot for handling the work. Like other advances in farming in recent years, proper treatment of fence posts, which in itself, may seem a small item to some, is important in the overall successful livestock operation and consideration should be given this program today toward eliminating problems and costs of tomorrow.

Although the cold-soak treatment is generally believed to produce the best results at lowest cost, another effective method of treating fence posts is the zinc chloride treatment.

Main advantages are: low initial cost of materials, peeling and drying made unnecessary, only simple equipment is required.

Fairly satisfactory results have been obtained by farmers, but no one can promise more than an average life of eight years with this treatment.

The South Carolina Experiment Station has simplified the procedure for treating with zinc chloride and offers the following on how to treat the posts:

1. "Trees of four to six inches in diameter should be felled, cut into lengths slightly in excess of seven feet, and allowed to stand one to several days before treatment. A week's standing should cause no injury at any season of the year.

2. Either the halves of tight wooden barrels or wooden troughs make satisfactory containers for the solutions during actual treatment. Metal vessels should never be used.

3. Treating solutions may be prepared from zinc chloride or copper sulfate, dissolving the salt at the rate of two pounds to one gallon of water, and stirring frequently with a wooden paddle to insure complete solution. The solution should be mixed in either a wooden barrel or stone container because of the corrosive action of the salts on the common metals.

4. Just prior to treatment, saw an inch off the basal end of each post to remove any gum accumulation.

5. Place the posts basal end down in the container holding the treating solution.

6. Allow two quarts of solution for each cubic foot of wood in the posts.

7. The posts should be allowed to remain in the container until all of the solution has been taken up. This occurs in 7 to 10 days.

8. At the end of the treating period, the posts should be removed and allowed to air-dry with the basal end turned up for at least a month before setting in the ground to a depth of 30 inches.

Treatment with zinc chloride solution for four days at the basal end and three days at the top end also has been found to give satisfactory preservation. A similar treatment, using copper sulfate, is not recommended because a large amount of this salt at the top of a post causes corrosion of the fencing materials. Treatment of the base for seven days is preferred.

The following table will prove helpful in computing the amounts for a given lot of posts. Amount of solution (2 pounds zinc chloride per gallon of water) to treat 7-Foot Posts, one pound per cubic foot (approximate):

Diameter Inches	*Amount per Post Pints*	*Ounces Zinc Chloride per Post*	*Cost per Post at 8c. per Lb.*
3	1⅛	5⅛	3
4	2⅞	10	5
5	4	16	8
6	5⅛	21	11

South Carolina Experiment Station tests tend to indicate a maximum absorption of about 1½ pounds per cubic foot with a solution of the above strength.

Leaky troughs or barrels, failure to season the posts in an upright position with basal end up, and failure to place the basal end (which receives the heaviest treatment) in the ground, are the common errors which some make in treating by this method. Naturally, if the preservative is not in the wood, the wood cannot be expected to last. Failure to saw off a disk which would remove the rosin also prevents absorption of the solution by the posts. Do not allow rain water to dilute the solution. Treat under shelter.

Bahia Grass for Hay and Pasture

Condensed from the Florida Grower

E. H. Finlayson
County Agent, Escamba County, Florida

A GRASS first discovered by the author in 1935, growing on the streets and vacant lots of Pensacola, seems to be the answer to the need for a good perennial hay grass in the Coastal Plains section of the South. Pensacola Bahia grass has been proven by the Florida Experiment stations to be the best seed-propagated pasture grass tested by them. It is now proving its value in another field.

The Northern states have Timothy, which has not only supplied them with excellent hay for home use but also for shipment into other sections of the United States. The Western states have prairie grass that has furnished them with a good grass hay. The Coastal plains of the South, however, have never had a good hay grass, and have had to import vast quantities of Timothy hay from the north.

I have about a hundred acres of Pensacola Bahia grass on my farm in Jefferson county for seed production purposes. Last summer after harvesting the seed crop I decided to cut 60 acres of the grass for hay. Crawford and Brown Rainwater, who own Perdido ranch in Escambia, where they have a considerable acreage planted to this grass, decided to cut some of their planting for hay also. The grass on my farm had been seeded to Pensacola Bahia grass alone, while on Perdido ranch it was seeded in combination with Kobe and common Lespedeza. These two plantings gave us an opportunity to study the possibilities of this grass in producing a pure grass hay, as well as a mixed grass and legume hay.

On both places two cuttings of hay were made. The first cutting was made in July, immediately after seed harvesting had been completed. On my farm 1½ tons of hay per acre were secured. The grass field on this farm was divided into blocks of about 15 acres each. One block was cut, cured, and baled before another block was cut. The weather was very rainy and bad for curing hay.

Partly because of this it was decided to use the new method of curing hay by raking it into loose windrows with a side de-

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livery rake and turning it often, twice each day, with the same tool—to air cure it rather than leave part of the hay exposed to the direct rays of the sun long enough to bleach it. When the hay was thoroughly cured it was picked up from the windrows and baled with an automatic pick up hay baler.

Under normal conditions without rain, the hay was ready for baling in 50 hours. When rain was encountered it was found best to turn the windrows between showers as quickly as the stubble was free of adhering rain water. This process was repeated until the hay was cured and dry enough to bale. In case of one block of this grass, due to excessive rainfall, it took more than a week to cure. This hay was of low grade but was still very acceptable to live stock and contained no trace of mold.

One lot of this hay which was subject to rain on three successive days during the curing period was fed to two farm mules free choice with about the same grade of Timothy hay. The Pensacola Bahia hay was completely consumed before the mules started eating the Timothy hay.

The July cutting of Pensacola Bahia grass hay on Perdido ranch was handled without modern haying machinery. It was cut and allowed to cure in the swath. It was then raked up and stacked in large stacks, where the cattle are allowed to eat it directly from the stack. At time of writing the cattle had access to this hay and were eating with relish.

The second cutting was made the latter part of October and early November, on both places. On my farm the second cutting yielded only about half the tonnage of the first cutting. This lower yield was due primarily to the fact that all the fertilizer was applied to the grass in early spring, to stimulate seed production, and was largely exhausted by the first crop. For two cuttings of hay per year two liberal applications of a complete high-nitrogenous fertilizer should be applied. The first should go on in early spring, and the second should follow immediately after the first cutting.

On Perdido ranch excellent weather was encountered with the fall cutting. Due to the dry weather and the fact that the grass was rather mature, they were able to cut the hay, windrow it, and bale the next day. This cutting turned out some exceptionally good Pensacola Bahia and Lespedeza hay. No record was kept at Perdido ranch on the yield of hay per acre, on either the summer or spring cuttings.

Pensacola Bahia grass was found to be exceptionally well suited for hay production. It is a dry grass, very low in moisture

content, and cures quickly. It produces a bright-green hay that is relished by live stock. It is a perennial—making a permanent hay meadow that yields well on a wide range of soils and can be cut at least twice annually.

From the experience gained on these two farms this year, I feel no hesitancy in saying that Pensacola Bahia grass has great possibilities for filling the hay-grass need of the coastal plains of the south as Timothy has filled it in the north.

While Bahia Grass hay had a value of from $40 to $50 per ton last fall, it is possible that the greatest worth of this grass to Florida is as pasture. On dry, sandy soil at West Central Florida Experiment station, unfertilized Pensacola Bahia produced more beef per acre in 112 days than the next best grass under the same conditions produced in 122 days.

There have been reports that Pensacola Bahia was unpalatable. In experiment station grazing tests during 1944, however, steers on Pensacola Bahia made gains of 1.12 pounds per day as compared to gain of 0.41 pounds daily for cattle on common Bahia. At the main station in Gainesville the ability of Pensacola Bahia to produce beef is indicated by comparison of grasses grazed from March 30 to November 1. Pounds of beef gain per acre and average daily gains for each grass are as follows: Fertilized carpet grass, 141 and 0.62; carpet-Lespedeza, 200 and 0.99; Pangola, 273; Pensacola Bahia 268; and Coastal Bermuda 257. There was little variation in daily gain between the last three grasses.

There are other factors related to this grass that make it especially adapted to Florida pastures. It withstood drought that killed both carpet and common Bahia. Observed with seventy-five grasses damaged by frost, it proved third most resistant.

Seeding Grass by Airplane

Condensed from Montana Farmer-Stockman

C. Allan Friedrich

THE picture of economic devastation left by a forest fire can frequently be brightened by broadcasting grass seed over the burned area from an airplane.

The soil-protecting cover obtained may not look as good to a lumber-jack as a thrifty stand of ponderosa pine, but it is much better than only barren, eroding soil beneath the blackened snags. Airplane seeding to grass has also proved to be a practical means of providing abundant forage on burned over lands during the period that the forest cover is reestablishing itself.

Results obtained on the 1944 Henry creek burn on the Cabinet national forest prove that successful seeding can be done at very low cost. The Cabinet national forest and the Northern Rocky Mountain forest and range experiment station together seeded a selected area of about 225 acres of the Henry creek burn on Nov. 3, 1944. The total cost for seed and airplane hire amounted to a little under $1.50 per acre.

In July, 1946, the second growing season for the grass, it was estimated, on the basis of sample plots clipped to 1 inch above ground level, that there was an average of 2,620 pounds of green forage per acre on the 225-acre seeded area. This yield represents a grazing capacity of approximately ¾ of a cow month per acre, assuming conservative use.

A similar unseeded area nearby produced about 1,400 pounds of weeds, mainly China lettuce, knotweed and mustard, in contrast to the 3,000 pounds of timothy, orchard-grass, Kentucky blue and bulbous bluegrass on the seeded portion of the burn.

Success similar to that at Henry creek cannot be obtained on every acre that happens to be swept by a forest fire. Conditions were less favorable on the portion of the O'Keefe creek burn on the Lolo national forest a few miles northwest of Missoula, which was seeded by airplane in October, 1945. Here the slopes are mainly south-facing, and only about 20 to 25 percent of the seeded area was covered with trees.

Results at Henry creek and O'Keefe creek have been studied to determine why seeding was successful in some places and

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failed in other places at both areas. The following conclusions are well supported by evidence on the ground:

Chances for successful seeding are very good under dense stands of fire-killed timber. There seem to be several logical reasons for this:

1. Not many grasses or shrubs ordinarily grow under dense timber. When the trees are killed by fire there is little vegetation left to compete with the seeded grasses.

2. Dense timber frequently produces such a hot fire that it not only kills the trees but also most of whatever scattered undergrowth is present.

3. Dense timber is often an indication of fair or better soil and moisture conditions.

4. Burning of the soil litter, small twigs and leaves results in a considerable layer of loose ashes that provides both cover for the seed and extra nutrients for the seedlings.

Thus a hot fire in dense timber provides the type of seedbed required for successful broadcast seeding, fair to good soil and moisture conditions, a clean, competition-free seedbed, a loose enough surface to provide covering of seed and abundant nutrients for good seedling growth.

For best success seeding must be done during the first fall following the fire, before the soil becomes crusted, before the ashes are washed away and before other plants can get a head start on the seeded grasses. This does not mean that worthwhile results cannot be obtained by seeding at a later date, but that seedbed conditions ordinarily become less favorable with each passing month.

The plane used for seeding the two areas mentioned was a 6-place craft often used for dropping smoke jumpers and supplies on forest fires. The seed was broadcast from a crude hopper, home-made from a wooden packing box and a 2-foot length of 6-inch galvanized stove pipe. The box was placed in the doorway of the plane with the stove pipe sticking out at an angle, down and back. No special force-feed or spreader was used. The suction of the slip stream was strong enough to draw the last handful of seed from the hopper. Rate of seeding was regulated with a sliding paddle over the hole in the box.

The role that airplane seeding of burned-over timberland to grass should play in a progressive land use program for western Montana is not yet entirely clear. That seeding can be done successfully and economically under certain conditions has been shown, and the principal site factors influencing success have been determined. Some of the other factors affecting desirability of seeding have not been defined except in a general way.

Satisfactions in Extension Work

Condensed from Better Farming Methods

J. R. Lintner

COUNTY agent work, as conceived originally by Dr. Seaman Knapp, is simply teaching through demonstrations.

Classrooms are the great outdoors. Texts used are combinations of the best local farming practices, plus all applicable information that is available from experimental stations, leading agronomists and livestock husbandmen, and the many scientists working for improved production methods.

Extension work is not a dream of idealistic rural life. *It is the practical means through which agricultural education can be carried from college and experimental work to every rural community.* It simply extends modern findings to rural people for use on their own farms, and in their own homes. This is the county agent's job. If reasonably successful, he will experience satisfaction. Satisfactions are to be earned.

It is, of course, not humanly possible to please every rural dweller, but it is highly possible to inspire many, by promoting needed improvements that result in better living. Not every idea worthy of promotion will take root extensively, at once. It is the job of a county agent to study his classroom; the farms of his county, and to consult widely with the best farmers and best public-spirited citizens not directly engaged in farming. Thus, he is working with, and not for, his farmers.

A county agent must be a leader; not necessarily out in front, but of the "back seat" driver type who is not looking for acclaim. Credit eventually accrues when earned. Satisfaction naturally follows success.

Satisfactions may properly be enjoyed, when livestock and crop statistics show steady gains in a county, as one example. "Helping farmers to help themselves" is the basic creed of extension work in agriculture. It is taken for granted that a county agent must be well informed, else he could not effectively extend agricultural education.

It has been a matter of considerable satisfaction through a period of more than twenty-five

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years, to have promoted the growth of dairy herd improvement from one group of some 800 cows, to five groups of 5,250 cows. DHIA works as a true cooperative. It is good to see the advent of a soil conservation district now in operation, and a modern soil survey under way in 1947. Both are cooperative enterprises, highly important to the economic welfare of all county people, the state and the nation. Looking over the hurdles prefacing achievements in agriculture, practical performance tests are needed both by the county agent and leaders in his county classroom. This means that sound and applicable experience is needed to achieve satisfactions in this type of teaching. It is justified satisfaction to now see many thousands of acres of ladino-grass pastures, and alfalfa meadows on practically all dairy farms having suitable soils, and high fertility levels, in proper balance.

Since the true purpose of extension work is to raise the general levels of rural living, it must embrace agricultural economics in program planning, and the wide use of such plans. This means that some type of general county farm organization is needed as a medium of communication among farm communities.

It is a very great satisfaction to note 4-H members of former years progress into the full responsibility of their county citizenship. Many of them are to be found as members of county governmental boards and leaders in civic bodies. They carry on the annual 4-H county fair that has superseded the old county fair. We need no side shows. Agriculture and rural living only, are featured. This is a real satisfaction.

It is a satisfaction to note, after many years of working with farmers, that in all sections of the county major crop diseases have been reduced to a minimum, adapted hybrid corn strains have almost completely replaced open-pollinated corn, and mediocre strains of barley and rye have been replaced by Wong barley and Clinton oats.

A final satisfaction is, that after twenty-seven years as county agent in one county, no disagreeable experiences have occurred with my superiors at either state or federal levels, and there still remains the urge to promote improved farming practices.

Cattle Now Eat Potatoes

Condensed from Better Farms

THE successful substitution of raw potatoes instead of grain for fattening cattle has been successfully carried out in experiments at the Flanders, N. J. Aberdeen Angus cattle farm of Eugene K. Denton, says Prof. William Ljungdahl, of Rutgers University Department of Animal Husbandry.

The experiment is a radical departure from accepted feeding methods. It is based on a now-proven formula of ground potatoes, salt and molasses, evolved by Mr. Denton after five years of practical research on his own herds.

Success of the undertaking is assured, according to Prof. Ljungdahl, who cites statistics based on the 25-day feeding period of 20 head of lean, range steers purchased by Mr. Denton for the project.

The 20 yearlings, purchased at Warrenton, Va., weighed a total of 13,350 pounds, or an average of 667½ lbs. on October 28, the purchase date. On November 5, the experimental herd was placed on the Denton potato formula on the 323-acre White Gates Farm. After 25 days on the formula, these steers were reweighed on November 30.

The average gain per steer for the 25-day period was 1.40 pounds per day, or 25¼ pounds per steer for the test period. The potato diet gain was substantially the same as it might have been if the steers had been started on the traditional corn diet. The health of the animals was perfect.

Substituting 50 pounds of potatoes for 16 lbs. of corn per steer daily the Denton experiment used more than 25,000 lbs. (12½ tons) of potatoes. This saved 320 pounds of corn per day or 8,000 pounds for the 25-day period. The growth-producing and carbohydrate content of corn is reproduced exactly in the substituted potatoes.

According to Rutgers University authorities cattle can thrive indefinitely on the potato diet and may be carried through the winter on such a ration, and readied for quick and profitable Spring market.

The potato plan, which has been the farmer's dream for many years, has failed previously for two reasons, according to cattleman Denton. Sufficient dry rough-

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age was not provided the animals to keep them healthy, and potatoes were not prepared in a palatable manner.

The successful Denton formula, if followed by the nation's farmers, may be used by all cattle raisers, provided they will make provision for winter potato storage, with great saving not only of scarce and expensive corn, but of money, in times of potato surplus:

1. At 5: 30 A.M. feed cattle as much hay-filler as they want for roughage.
2. At 7 A.M. feed half of daily requirement of potatoes, ground fresh before feeding.
3. Give steers as much water as they want all day.
4. At 6 P.M. again feed half of the day's potato ration, plus hay again.
5. Feed same protein and mineral supplements as followed in customary corn feed diet.

Potato preparation is simple and cheap. To every 100 lbs. of freshly sliced raw potatoes, add one handful of regular salt, and one gallon of molasses water. Molasses water is prepared simply by adding one pint molasses to one full pail of water. On White Gates Farm Denton runs his potatoes from sack through an ordinary silage cutter for grinding before each feeding.

This year's corn makes next year's meat for the world, and a great part of next year's dairy products, poultry and eggs. The 1947 corn crop of 2,437,000,000 bushels is down 14% from the "break-even" point on livestock production on American farms. The corn shortage is even greater on dairy and poultry farms. With more than 81,055,000 head of cattle on American farms today, it is feared the corn shortage may cause farmers and cow-men to slaughter livestock prematurely to fit herds to the available supply of corn. This means less meat at home, and higher prices. The shortage of domestic corn has caused the United States to import large quantities of grain from Argentina at abnormally high prices for shipments overseas to occupied countries.

Millions of bushels of surplus potatoes are rotting unstored in the field although the U. S. Government offered them free to farmers who had little or no use for them.

With the advent of the revolutionary Denton formula, future corn shortages may be alleviated, and millions of cheap surplus waste potatoes may release corn to the starving and inflation-ridden world.

In the opinion of Prof. Ljungdahl, the Denton formula beef will be a better grade, heavier in weight, and taste better than much of the beef now reaching market. As a result of a recent

inspection, the 20 steers were pronounced healthy and sound by Prof. Ljungdahl. The same results would be evident if the Denton formula were applied to cattle of beef breeds, he declared.

Authoritative tests like this, Prof. Ljungdahl pointed out, would ordinarily be carried out over a 120-day minimum period, and given the average 16–18 lbs. of corn per day, the animals would show a maximum gain of 1½ to 2 lbs. per day. The short 25-day weighing-in period can be considered all the more remarkable therefore in that the gain of the Denton steers on the balanced potato diet closely approaches that figure.

"The Denton project will go on indefinitely with even more remarkable results," says Mr. Denton, "as it is to be maintained over a 120-day usual feeding period."

Mr. Denton, one of the East's leading breeders, whose pure-bred herd of over 200 head numbers several prize animals of grand championship calibre, stated, that if there is a surplus of potatoes next year when he takes his herd off the pasture, he will put them on a permanent potato diet.

When Your Freezer Stops

What would you do with the food in your freezer if the electrical power suddenly went off? It could happen at any time, but snow and ice of winter will come nearer gnawing your wires apart. Storms the year round cause your lights to blink and sometimes go off completely. Then there's the electrical power shortage to think about. And the meat you have on deep-freeze is as valuable as the bills in your wallet.

If power can be re-established in a few hours you need not worry, says the U. S. Department of Agriculture, but if power is off more than 12 hours the food in the freezer is endangered. Furthermore, once the food is entirely thawed it is not advisable to refreeze it.

The best solution to this problem is to go to the nearest ice cream manufacturer, creamery, or any cold storage plant and get dry ice. Dry ice is effective even up to seven or eight hours after the power has gone off. A 50-pound cake may hold the temperature to 15 degrees F. for nearly 48 hours.

Dry ice should be chipped onto a board or heavy cardboard resting on packages in all compartments.

—Nebraska Farmer

How To Heat With Wood

Condensed from American Forests

Robert W. Schery and Dennison H. Morey

Wood has long been one of man's most important fuels. Even today in this materially advanced country, almost as much wood goes into fuel as into lumber. Yet the average American knows little about fuelwood. When he throws a log on the fireplace, for instance, it is doubtful if he gives much consideration to its fuel qualities. More than likely his choice is dictated by the kinds of wood available to him, plus personal preferences due to past associations and emotional experiences. In a general way, of course, he knows from experience that some woods burn better than others, give more heat, or last longer—in other words, that superior heating qualities in certain woods are not inherent in others. But relatively few have made an effort to evaluate quality in firewood objectively.

Last year, for the Missouri Botanical Garden, the writers had opportunity to analyze statistically by actual measurement firewood qualities in a number of woods local to Missouri, and because their findings aroused considerable local interest among fireplace devotees, they are passing them on to others who enjoy a crackling fire or are forced by conditions to heat with wood. It is realized, of course, that the local character of this study places a limitation on the number of woods tested, but they have wide enough range to be of value to most eastern readers.

The value of wood as a fuel rests upon the nature of wood substance—that essential material of plant stems made only by green plants from air, water, sunlight and a handful of soil minerals. Wood substance, the walls of the tree trunk cells exclusive of any contained air, consists of complex chemical materials known as cellulose and lignin, plus small quantities of other substances such as oils, tannins, or resins. It provides roughly four calories of heat for each gram of wood burned. This is true of all kinds of wood, for all woods have essentially the same chemical substances in the cell walls. No matter what wood is chosen, be it softwood or hard-

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wood, a pound of it, bone dry, can supply approximately 8,600 B.T.U. of heat. So the most efficient fuelwoods are apt to be the heaviest, for these generally provide more pounds of wood substance a log than do lighter woods. Selecting a few common firewoods from tables of the tests made, it is possible to compare relative weights as reflected by their densities—that is, weight a unit volume, or pounds a cubic foot as compared to the weight of a cubic foot of water:

Wood	*Density*
Apple	.80
Locust, black	.76
Mulberry	.74
Oak, pin	.71
Ash	.66
Birch, river	.55
Maple, silver	.54
Elm	.54
Boxelder	.41
Poplar, cottonwood	.38
Most softwoods (pine, fir, spruce, etc.), below	.40

Thus, neglecting other factors, the log of apple could give approximately twice as much heat as could cottonwood or a softwood, and a little more than half again as much as river birch or silver maple.

Firewood under normal conditions is never completely dry. When a log is first thrown on the fire heat must be borrowed from the already burning wood to expel or evaporate residual moisture in the new log. Thus "green", newly cut wood, will not burn as efficiently as will seasoned, or partially dried wood, nor is it easily ignited except in very hot fires. Referring again to the tables of woods tested, it was found, for the same woods previously chosen, the following percentages of moisture remaining after more than three months' outdoor seasoning:

Wood	*Percent moisture*
Locust, black	24.6
Elm	26.1
Ash	29.0
Oak, pin	35.7
Mulberry	37.4
Apple	37.9
Maple, silver	38.9
Birch, river	40.5
Boxelder	41.6
Poplar, cottonwood	52.1
Softwoods—not tested	

Thus cottonwood remained about twice as moist as black locust or elm, and would have wasted proportionally more heat from an established fire before burning.

After evaporation of residual moisture from a firelog, volatile materials or gases are next expelled. This, too, requires absorption of heat from the established fire, but unlike the expelled moisture (steam), these gases are

mostly capable of burning and in turn releasing their own heat. Such volatile materials comprise the pyroligneous acid of hardwood distillation, and upon burning become the flame of a fire. A fire not sufficiently hot to ignite these gases, or with insufficient air available to permit complete burning, is wasteful of potential heat. Moreover, if such volatile materials are not burned immediately as volatilized from the log, they may condense on the chimney flue as "creosote," becoming objectionable in appearance and a subsequent fire hazard. A smoky fire without flame is conducive to "creosote trouble," and hard-to-burn hardwoods are most apt to be objectionable from this standpoint.

The resins or oils of hardwoods such as certain ashes or birches are very easily volatilized and ignited, and a wood of this kind may burn well even in the rain. The resins of most softwoods likewise burn well, so that spruce or hemlock limbs or pine butts are quite appropriate for a quick, sparkling fire with a bright flame. It has been brought out, however, that softwoods are generally of light weight and thus won't give *quantity* of heat in comparison to most hardwoods.

Turning again to the tables, it is interesting to compare ability of the same woods to "kindle," that is, to ignite and hold a flame. Without going into details of the test (based upon timing flame with a stop-watch after measured exposure to a constant gas flame), let's score the various woods from one to three—three being the most easily and one the least easily kindled:

Wood	*Score*
Birch, river	3
Elm	2
Locust, black	2
Poplar, cottonwood	2
Ash	2
Maple, silver	2
Boxelder	2
Oak, pin	1
Mulberry	1
Apple	1
Softwoods	2–3

The final phase of the burning of wood, after both moisture and gases have been expelled, is the glowing of coals or formation of embers. In this phase no heat is diverted to effect evaporation or volatilization, and maximum quantities of heat are produced by the burning of the fixed carbon of wood substance. Woods producing long-lasting coals are especially efficient as firewood. Heavier woods (hardwoods) are generally best for this purpose. Now let's see from test charts how the selected samples measured in comparison of coal duration with flame duration (wood samples were burned in an electric oven, timed with a stop-watch). In the

figures given, the higher the ratio the higher will be the length of time the coals endured compared to the length of time the flame endured:

Wood	*Ratio*
Mulberry	20.9
Apple	15.8
Birch, river	15.4
Oak, pin	15.3
Locust, black	14.4
Elm	13.8
Ash	13.2
Boxelder	11.5
Maple, silver	11.0
Poplar, cottonwood	10.9
Softwoods—not tested	

On the basis of tests reflected in the various tables mentioned, a final score was given each wood. Points were allotted for degree of superiority in each test given, and by adding these points a total numerical score was developed for each wood tested. How did the woods fare in the final scoring? The highest score of all was twenty-one, for osage-orange, and the lowest was two, for cottonwood poplar. The woods dealt with in this article rated as follows (higher number indicates "all-around" superiority as a firewood over lower numbers):

Wood	*Score*
Locust, black	20
Mulberry	18
Apple	17
Ash	17
Oak, pin	15
Elm	14
Birch, river	10
Maple, silver	9
Boxelder	5
Poplar, cottonwood	2
Softwoods—not comparatively tested, but probably about	7–14

Wood, well burned, is a relatively efficient source of heat. One cord of good dry hardwood (weighing almost two tons) will produce more heat than a ton of coal. Moreover, no objectionable smoke will result from a wood fire properly set, and much less objectionable ash will remain after burning than is the case with coal. Wood is a clean fuel, generally available, and relatively simple to gather and handle. However, as in any endeavor, certain procedures in producing firelogs develop a superior product. These involve cutting, splitting and piling or storing of wood.

Having selected a wood for its fuel capacity, and having felled and sectioned the tree by whatever local means are best available, the process of "putting up" a wood pile becomes of prime concern. As has been pointed out, a crucial factor in the burning of wood is its dryness. Relatively dry wood of any species of tree will prove usable as a fuel, but green or water-soaked wood is less satisfactory—or even valueless. There-

fore, proper handling to facilitate drying and prevent water soaking is of great importance.

Generally speaking, logs four to eight inches in diameter should be halved—split at least once through the center. Splitting is commonly accomplished with ax, wedges and a tapered sledge. Logs greater than eight inches in diameter are probably best slabbed or quartered. Slabbing consists of splitting or sawing off sections of the log until only a small core remains. It is frequently the only method possible with logs too large to be split through the center. However, slabbing is less preferable than quartering, since with a slabbed log the center section becomes exposed to the weather.

In a quartered log there remains a water-proof roof of bark upon each quarter section. Quartered sections carefully piled with the bark side up will effectively shed much of the rain and snow that falls upon them. Halved logs will shed water at least equally well. Many woods, such as ash, cherry, birch, black locust and silver maple split quite easily. Others such as elm, unclear beech, old apple and hard maple, poplar, certain oaks and softwoods are more difficult to split.

Unsplit logs shed water most reliably of all. However, the water-tight bark also prevents internal moisture of the log from escaping. Thus drying is slow in unsplit logs, taking place to a large extent only through the cut ends. In small logs under four inches in diameter, this drying is rapid enough to season the wood, but in large logs, especially heavy, non-resinous woods, drying may take an indefinite time. Indeed, a large, unsplit oak log may rot before it dries completely, as will white or paper birch if left unsplit or piled on damp earth.

Precaution should be taken in piling wood. The piles should be laid on a foundation of two small logs or "runners." These support the pile above the dampness of the soil and provide space for runoff of precipitation percolating through the pile.

Success with any wood fire lies in the quality and handling of the wood. Generally speaking, the best fire will be provided by a heavy wood, carefully piled and seasoned to a reasonable dryness. Most firewood should be split at least once, and should be stacked upon runners, bark up, to protect the drying wood from further soaking. Following the objective criteria given for selection of wood, and a few simple procedures for handling it, any fireplace enthusiast should be insured of a blazing hearth on long winter evenings.

Brooders Help Save Lambs

Condensed from Ohio Farm and Home Research

D. S. Bell and Carl H. Bradford

ANYONE who has attended a lambing band of ewes during the cold winter months, when the temperature may fall below zero, needs no words to remind him of the inconvenience, hardship, and discouragements involved. The chilling of new-born or very young lambs and the resultant loss, or the need for constant attention and care to avoid loss, has been the main drawback to early lambing in colder climate.

Apart from the probability of chilling, however, there are many advantages which follow from having lambs born early. If some device could be arranged to eliminate the need to carry chilled lambs to the kitchen stove or to eliminate the jug of hot water or heated brick, which the lamb often leaves anyway, the principal drawback to early lambing would be overcome.

Chick brooders and pig brooders have been developed and are in use. Why not a lamb brooder? Perhaps something could be developed which would eliminate the chilled lamb problem. Various attempts have been made to develop lamb brooders. Some arrangements have been fairly successful, some of doubtful value, and a few have been complete failures and hazardous contrivances. Some attempts seemed to solve one phase of the problem and in doing so created other problems. A device which would meet all requirements was called for.

A study of the problem and a review of conditions to be met brought out the fact that there are a number of requirements peculiar to the sheep barn. To be successful a brooder must be safe, cheap to build, sturdy in construction—durable, portable, convenient, positive in operation—and it must fit into a 4 by 4 foot lambing hurdle which most flockmasters use. In addition, it must provide steady heat of the proper intensity and have some practical provision for regulating the intensity of heat according to varying conditions of outside temperature.

Because of sheep temperament and disposition, the brooder must be so constructed that the ewe can see and contact her lamb at all times in order to promote the family bond. Any separation of

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lamb from ewe often breaks the instinct to mother and results in a disowned lamb which can be as great a problem as a chilled lamb.

The conditions to be met suggested a triangular shaped, shallow brooder, open in front with a heat unit that would take the freezing effect off sub-zero temperatures. Accordingly, an experimental model was built at the Ohio Experiment Station, put to service, and then modified to gain the additional advantages which seemed desired. Eight brooders of the improved design were built and put into use. After a full season's trial, which has drawn the enthusiasm of flockmasters who have seen these in operation and who have built similar brooders for use with their own flock, it is considered worthwhile to give all particulars regarding construction and use.

The individual brooder, which can be used for 1 or up to 4 or 5 lambs, is triangular in shape so that it will fit into a corner of the lambing pen. The sides extend out 2 feet and the brooder is 30 inches high. A hood effect at the top is gained by facing boards totaling 12 inches wide which extend down from the top and across the front. The floor of the lambing pen serves as the floor of the brooder as the bottom is open. To make the box rigid, a 1- by 2-inch strip extends across the front at the bottom. A triangular section 6 inches wide at the rear of the top section is hinged so that it may be opened to gain a flue-like effect. Opening this flap to any desired extent draws off some heat and makes the intensity of heat thrown downward adjustable according to outside temperature.

The heating unit is a 150-watt R-40 reflector flood bulb. This bulb is mounted in a porcelain receptacle installed on a 3- by 3-inch metal box. The metal box is fastened securely in the center of the ceiling of the brooder with wood screws. The bulb, therefore, hangs from the ceiling and the heat is directed downward. Duplex cable and a heavy duty plug conduct the current from a wall outlet to and through the top of the brooder, into the metal box and to the attachment points on the porcelain receptacle base.

The bill of material for constructing and equipping each small individual brooder includes:

3 boards—1 in. × 6 in. × 10 ft. (matched, for sides and top)
1 board—1 in. × 6 in. × 12 ft. (matched, for face and front)
1 strip—1 in. × 2 in. × 2½ ft. (brace strip—front)
1 angle sawed—2 in. × 2 in. × 2½ ft. (nail strip in angle at back)
1 pair 3 in. hinges (for flue flap)
1 150-watt R-40 reflector flood bulb
1 porcelain receptacle
1 3 in. × 3 in. metal box
1 heavy duty plug
Duplex cable of length desired

If one wishes he can add asbestos sheet to the inside of the hood. The brooders made and used were not fitted with asbestos and no high temperatures approaching

anywhere near dangerous limits were noted.

There are several points in the management and use of this brooder which merit special attention. It is important that the proper reflector flood bulb be used. Spot lamps and heat lamps, because of the intensity of heat and concentration of the beam, are not suitable and may be dangerous.

Neither more lambs (not over 5) nor larger lambs (several weeks old) than was originally intended should gain access to this small brooder. Too many lambs may crowd into it and pile up if given an opportunity. One may be smothered underneath, or one may climb on top and be burned through contact with the bulb.

The brooder should be securely anchored so that it can't be upset; and the attendant should not forget to raise the brooder if straw and manure accumulate and begin to bury the base.

The attendant should make certain that the ewe cannot chew or tug at the "hot" wires which bring the current to the box. An inquisitive old ewe might pull the plug or "short" the line—either of which will cut off the heat—and shorted circuits are dangerous. It goes without telling, too, that the line from the fuse box must be fitted with proper fuses that will "blow" if a shorted circuit should occur.

Under proper use and management these individual brooders appear to be as safe as any electrically equipped fixture can be made.[1] The brooder solves (with outside temperatures as low as 8° F. below zero) practically all of the problems associated with chilling among newborn or very young lambs. With heat at hand it is amazing how often and how quickly a little lamb will find it. It does not relieve the point of shepherding attention to get little lambs breathing and started or the need to place them under the heat when temperature may be low enough to chill the lamb before it can rise and move around. After the lamb once finds the heat it will make effective and almost continuous use of it; and it reposes where the ewe may contact it as frequently as she wishes.

With the matter of a brooder for the new-born and very young lambs taken care of until they are old enough and strong enough to turn out of the lambing hurdle, the question of whether to continue a brooder program remains. Several colony brooders were built and used. Every lamb which had access to this colony brooder used it continuously except for nursing times. Certainly, if outside tem-

[1] Even though these brooders have appeared safe, it would be well for each one who contemplates their use to check with his insurance agent to make certain that nothing in the policy is nullified or voided through their use. In any case, the wiring should meet the code requirements of the Association of Fire Insurance Underwriters.

peratures are low, if the ewes are not milking well, if there are a number of weak lambs, or if the quarters do not afford pens free from cold drafts, then a colony brooder, or some lamp device which gives the effect of a brooder, may be used to advantage. Outright recommendation of this colony brooder is withheld until other devices which may be cheaper to construct can be tried. The one built and used serves admirably.

The colony brooder, which will accommodate 25 little lambs up to 2 or 3 weeks of age was built 36 inches high, 40 inches deep, and 8 feet long. This brooder should be 40 to 42 inches high, 40 inches deep and whatever length is desired according to the number of lambs to be accommodated. As constructed, 1 square foot of floor space was allowed for each lamb and this proved adequate. The two ends, the front and back, and the top were built as separate sections and put together with bolts. This allows quick erection and equally quick dismantling for storage when not in use.

The bottom is open; the pen floor serves as the floor of the brooder. The front section has a 14-inch by 6-foot opening with a 6-inch board across the bottom for sturdiness. Any lamb securely on its feet can negotiate this 6-inch board. In addition, the opening in front was fitted with an adjustable board which could be raised or lowered to make the opening wider or narrower, according to size of lambs and to keep the smaller ewes from crawling in, or to adjust to breeds of varying size.

The top section was split and hinged so that the front could be raised to afford ready access to the interior, if necessary, and also to allow for blocking it open slightly to let out excess heat when outside temperatures rise. Two 150-watt R-40 reflector flood bulbs were used for heat, and were attached to the ceiling of the secured half of the top.

The bill of material includes:

21 pieces—1 in. × 6 in. × 8 ft. or equivalent (for front, back, and top)
5 pieces—1 in. × 6 in. × 10 ft. for ends
2 pieces 1 in. × 4 in. × 10 in. batten strips
1 piece 2 in. × 2 in. × 14 ft. bolting strips
12 bolts—$\frac{1}{2}$ in. × 3$\frac{1}{2}$ in.
1 pair 4 in. hinges
2 150-watt R-40 reflector flood bulbs
2 porcelain receptacles
2 3 in. × 3 in. metal boxes
1 heavy duty plug
Duplex cable of length desired
(It would be well to add to this some material to be used as a shield or guard for the lamp bulbs. Two wire basket type horse muzzles should serve the purpose very well; 1$\frac{1}{2}$-inch mesh 16-gauge wire fox netting or 1- by 2-inch mesh, 14-gauge welded wire should be very good.)

No experiments have been conducted to determine the effect of using colony brooders on health, growth, and performance of young lambs. It was observed that diarrhea in little lambs—which has been present and difficult to cope with in years past—was absent when the brooder was used. This correlates well with the findings

of Pounden, Hibbs, and Krauss, who reported in the November-December, 1947, *Farm and Home Research* that many cases of diarrhea in young calves were coincident with sudden downward trends in temperature.

If the plague of diarrhea, and the elimination of chilled lambs, or a reduction in labor required to treat or avoid these troubles, are the only gains from brooders, the cost seems justified. Whether this colony brooder is the correct answer to the problem will be given further study. In the meantime we know that this one will serve adequately and that lambs will cooperate nearly 100 percent in making effective and continuous use of the brooder and thereby gain any benefit it may afford.

Cattle Can Get TB from People

Condensed from Hoard's Dairyman

Dr. J. Arthur Myers and Dr. Virginia L. Dustin
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IT HAS been known for a long time that man could get tuberculosis from infected cattle. He could acquire that infection not only by direct contact but also from eating improperly cooked contaminated meat, milk, and other dairy products. This bridge of contagion was so well recognized, in fact, and its resultant problems so serious both as a matter of public health and farm economy, that it brought about the most successful tuberculosis eradication program in history. Because of the far-reaching program, tuberculin reactors have become scarce among United States herds today and children are growing up without the hazards of bovine tuberculosis.

What is less well known is that a tuberculous person can also infect the cattle that are under his care. While tuberculosis among cattle has been nearly wiped out, tuberculosis among the human population is still very well established. The result is that although man is safe from the cow, the cow is not equally protected from her master. This contagion-in-reverse is particularly important to the dairyman, for ignorance of it has caused serious losses among valuable dairy herds and brought in-

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convenience and financial ruin to their owners.

Since 1892 three distinct strains of tuberculosis germs have been recognized: human, bovine (cattle), and avian (bird or fowl). Each of these three thrives best in its own particular host, but like the victims of the present housing shortage, when nothing else offers, they are adaptable to other shelter. The bovine germ, for instance, which has optimum growth in the bodies of cattle, thrives almost as well when introduced into the human system, causing the tuberculin reaction, illness in many cases, and not infrequently death. The human type will also grow in cattle, but to only a limited extent. Avian, or bird, tuberculosis, does not concern us here, but the other two are very important in a study of man-to-cow transmission. Let us inquire first into the present history of the bovine strain.

Since the eradication program, few new cases of cattle-type tuberculosis are developing among the people of the United States. Nevertheless there is a strong likelihood that a sizable number of those 25 years or older have this type of disease, contracted when cattle tuberculosis was still prevalent. Some of those persons now have or may later develop contagious tuberculosis from the descendants of the germs of the cattle type that were taken into their bodies many years ago. These germs can readily produce the disease in cattle when persons who have them in their sputum or in open sores are in contact with cattle or work with their feed and water. A dramatic case in point was recently observed by Tice of New York.

In 1929 Dr. Tice conducted a tuberculin retest on a clean herd of cattle belonging to a milk peddler. None of the adult animals reacted, but some of the calves did. The owner stated that he had been purchasing milk from an untested herd, separating it, selling the cream, and feeding the skimmilk to his calves. He was informed that he must stop buying milk from this source or the herd must be tested. There were 22 animals in this herd, all of which reacted to tuberculin and germs of tuberculosis were present in the milk. When the animals were slaughtered and the carcasses examined, tuberculosis was found in all of them.

The owner then purchased new cattle and periodic testing revealed no reactors until January, 1942, when five of the 24 animals in the herd reacted to tuberculin. Two months later the remaining 19, plus one natural addition, were tested and seven reacted. In April of the same year all of the 13 remaining cattle reacted. Thus between January and April, 1942, the entire herd of 25 cattle

had to be sacrificed because they reacted to tuberculin.

During the summer of 1942 the owner purchased 12 cattle which were non-reactors. They were tested by Dr. Tice in October, 1942, and two reacted. In January, 1943, two of the remaining 10 reacted, and in March, 1943, all of the remaining eight cattle reacted. This meant that in the period of October, 1942, to March, 1943, the entire herd of 12 was lost.

During the next three months the owner purchased five tested cattle, but in June, 1943, Dr. Tice found one of them reacted to tuberculin. Subsequently there was one natural addition to the herd and the owner added five more tested cattle. He now had nine (one cow had been sold for another reason) and when these were tested in August, two reacted. Of the seven remaining, five reacted in October, 1943. The remaining two cows later reacted to tuberculin.

After each test of the three herds, all reactors were removed and promptly slaughtered. The stables were cleansed and disinfected and the sources of the additions were checked. In no case had the period between the acquisition of an animal and the time it reacted to tuberculin exceeded six months. After the slaughtering of three complete herds, the source of the infection had not been determined. Dr. Tice carefully investigated all possibility of the animals having been infected from other animals but was unable to find such a source.

Then he learned that the owner of the cattle had been a patient in a tuberculosis sanatorium from March 12 to May 3, 1942. In November, 1943, cultures from the lesions of the cattle were typed at the New York State Veterinary College and at Homer Folks tuberculosis hospital. Sputum from the owner was also collected and typed at the same hospital. In May, 1944, after detailed laboratory examinations were completed, the results showed that the tubercle bacilli obtained from the lymph nodes of the cattle and the sputum of the owner were of the bovine type. It was concluded, therefore, that the owner contracted tuberculosis infection from the cattle which were slaughtered in 1929, but the disease did not manifest itself until 1942. In the interim none of his cattle became infected. But when the owner's disease became contagious, he infected one animal after another until he lost three herds.

After the last testing in November, 1946, with the complete loss of his herd, the owner agreed to discontinue dairying and to have no more cattle brought upon his premises. He promised, further-

more, not to have contact with anyone else's cattle.

As a result of careless handling, this owner lost 97 head of cattle from tuberculosis. He was compensated by state and federal funds, plus salvage, about full value (approximating $150 each) or between $14,000 and $15,000. However, from 1929 to 1942 his herd averaged 22 animals. After the infection began to appear in 1942 it averaged only 11. Removing so many reactors and the frequency of the tests caused him to maintain only about one-half a herd from 1942 to 1946, and at intervals he had no herd at all. His loss is represented by a partial loss of income (about $1,000 a year from 1942 to 1946). Now he is completely out of the dairy business and his farm is not adapted to anything else.

In all likelihood, if this owner and his family had been periodically tested with tuberculin, he would have reacted in 1929. Annual examinations thereafter would doubtless have revealed his trouble prior to 1942 before it became contagious and when it could have been treated successfully with minimum inconvenience. By so doing he would not only have maintained his own good health but that of his cattle.

The human-type of tubercle bacillus also passes from man to cow without difficulty. There is, however, this difference—the human type rarely causes serious disease in cattle. The areas of disease remain small and do not make them sick. There is no evidence that cattle which have the human type of tuberculosis transmit their germs to other cattle or to humans, but they do react to the tuberculin test. Thus a person with contagious tuberculosis of the human type, working with cattle and their feed, can infect them so they have to be slaughtered, resulting in considerable loss to the owner.

It is of primary importance to the dairyman that everyone who comes in contact with cattle, regardless of how well he may appear, should be adequately examined for tuberculosis. This disease is so deceiving that the healthiest appearing person may have it in contagious form. But by simple examination a physician can determine in a short time whether a person has tuberculosis and if so, whether it is contagious.

The first step in the examination is exactly the same for man as for cattle and other domestic animals—the tuberculin test. The same kind of tuberculin is used and it is administered the same way into the layers of the skin. The test is read in 72 to 96 hours. If there is no reaction at the site of the puncture it means the person has no bacilli in his body and no tuberculosis in any form. If a reaction does occur it indicates

there are at least small areas of disease in the body and that they contain living germs. It should be stressed that in neither human nor cattle do the small areas of disease ever present in the tuberculin reactors always cause illness or become contagious. The extent of infection, however, can only be determined by other methods of examination. Whenever a person, regardless of age, is found to react to tuberculin, other phases of the examination are necessary.

Chest X-rays should be given to all reactors because the disease more frequently attacks the lungs than any other part of the body, and here it is most likely to assume a contagious form. The X-ray is exceedingly helpful since areas of progressive lung disease large enough to cast shadows can often be seen for many months and sometimes years before they cause any manifest symptoms.

Unfortunately the shadows seen on an X-ray film do not tell us which disease they represent. Those caused by tuberculosis may be identical with those of lung abscess, lung cancer, fungus infection, and several others. When a shadow is found, it is important that other phases of the examination be done. If sputum is present it should be collected and examined for the presence of the microbe.

In the United States tuberculosis among humans has decreased rapidly in recent years, a situation which may be credited in no small part to the successful eradication of the disease among cattle. It is encouraging that in many rural areas the incidence of infection is extremely low, usually not exceeding 5 to 10 per cent at the age of 18 years, with no infection at all in a large number of schools at the grade school level.

The cattle owners of this country, by having examinations of themselves, the members of their families and all others who come into their home as hired girls and farm hands, can contribute mightily to the complete eradication of tuberculosis both in the human population and among domestic animals.

The Study of Animal Production and Genetics in Britain

Dr. John Hammond, F.R.S.

RESEARCH work on farm animals is expensive as compared with similar work on soils and crops. Furthermore facilities for animal work are less extensive so that it is necessary to ensure that the post-graduate student is well qualified to undertake the work—otherwise the limited facilities will not be used to the best advantage.

Authorities sending men for post-graduate study in Britain would do well, in my opinion, to give preference in selection to those who have some experience of the problems and livestock conditions in their own countries. They can then select a line of research which will be useful to their country when they return. A man who has come up against one or other of the major livestock problems of his own country knows what he wants to know and can seek it in research here. If this is done the task of the selection of the most suitable center at which to study will be simplified. I will give details later of the type of work which is going on at various British research centers.

The next point to consider is whether the post-graduate student should sit for a degree such as the Ph.D., or whether he should just come to study and do research work. This depends on what the man is proposing to do after he returns to his own country. Work for the Ph.D. in Universities in Britain involves doing original research work of a fundamental character in a very narrow field, fitting a man to become a research worker in this field. The time allowed—two or three years—is sufficient to obtain a depth of knowledge in a limited, specialized field, but because of the time necessary to do experiments on farm animals it is not sufficient to allow of a wide field being covered. These are the limitations imposed by the taking of a Ph.D. degree.

If, on the other hand, the man intends on return to his own country to do *teaching, advisory* or *administrative* work in the livestock industry he requires a wide knowledge of the advances being made in all branches of the industry, or in some branch in which he will in future operate. At present there is no University degree given for this aspect of post-graduate study, but there are facilities for acquiring the necessary knowledge. If a

man wants to acquire such knowledge his best plan is to become attached to two or more suitable Research Institutes or University Schools in turn for a year or more at each where he will have contact with, and assist specialized research workers in, different fields, obtain their outlook on different problems and see the technical methods used. For this purpose a man requires at least a year at each research center for, unless he is an experienced research worker, it is difficult to obtain a solid basis of knowledge from a short visit only, unless it is in a very restricted field of work.

Suppose, for example, a man aims at becoming an adviser on the sheep industry in his own country: he could, in Britain, spend one year at the School of Agriculture, Cambridge, studying reproduction, fertility, growth and development of mutton qualities, spending some of his time at the Low Temperature Research Station, Cambridge, and the Smithfield College of Food Technology, London, where he would obtain an idea of the technology and requirements of the meat trade. For the second year he could go on to the Rewett Research Institute, Bucksburn, Aberdeen, where he could take part in experiments concerning rumination and other aspects of nutrition. For the third year he could go either to the University of Leeds and the Wool Industries Research Association Institute at Torridon, Leeds, and study wool quality from the point of view of the requirements of the woolen industry, or he could go to the University College of Wales' Department of Agriculture, Aberystwyth, where he could study problems of health in relation to nutrition and the improvement of pastures for sheep grazing in mountain country. Such a training should give a man an insight into the problems of the sheep industry and the methods employed in their solution, and should equip him to develop the sheep industry in his own country.

If, on the other hand, a man aims at becoming a specialized research worker on, say, problems of fertility in sheep, he could come to Britain and enter the University of Cambridge as a candidate for a Ph.D. degree. He would then select a problem for research, say the causes for the limited duration of the breeding season in the sheep, and would be given some 20 or so ewes on which he would have to plan experiments and show how he could change the time of their breeding season at will. To do this he would have to read all the available literature on the subject, attend lectures on related subjects in adjoining pure science laboratories, from which he would also obtain help in technical details concerning methods of research, and eventually he

would submit a thesis setting out the details of his experiments and the conclusions at which he arrives. This would occupy three years of intensive study and investigation during which time he should obtain a sufficient depth of knowledge on the subject of fertility in sheep to supply him with research problems in this field to last him the rest of his life.

Now let us consider the facilities available for the study of livestock problems in Britain.

British agricultural education and research is now undergoing reorganization. The Schools of Agriculture, at Universities, which were formerly supported by Ministry of Agriculture funds have just been taken over by the Ministry of Education and will be financed, like other Faculties in the Universities, from a University Block Grant. At the same time those Research Institutes—such as the Institute of Animal Genetics, Edinburgh and Animal Nutrition Institute, Cambridge—which were financed by the Agricultural Research Council and attached to Universities, have now been liquidated, and the Agricultural Research Council are proposing to set up shortly new research institutes under their direct control. These include an Institute of Animal Genetics and an Institute of Animal Physiology—but as yet their location has not been announced. Under arrangements which have existed up to the present, visiting research students could work at these Agricultural Research Council Institutes under guidance of University officers for Ph.D. degrees, but what the position will be in the future, now that the Research Institutes have been detached from the Universities, we do not yet know. In view of these present uncertainties as to the future position, the best one can do at present is to give a short account of the research work which has been done at the various centers in recent years.

The Rewett Research Institute, Bucksburn, Aberdeen, adjacent to the University of Aberdeen, has concentrated on work on animal nutrition, particularly in regard to the mineral and vitamin requirements of animals. They have also worked on the nutritional requirements of the pregnant ewe, particularly in relation to the prevention of diseases such as pregnancy toxaemia, and are now undertaking research on ruminant digestion and the microbiological changes going on in the digestive tract. Located there is the Imperial Bureau of Animal Nutrition, which abstracts and publishes world literature on the subject.

The Department of Animal Genetics at Edinburgh University has, adjacent to it, a poultry genetics unit of the Agricultural Research Council, where, by inbreeding, an analysis is being made of

the factors which affect egg production. In recent years, experiments on inbreeding and selection in pigs have been made, and statistics from cattle and pig herd books have been studied to provide facts concerning the number of pedigree males of different breeds available for livestock improvement, the size of breeding herds and the duration of life of herds, and other factors which affect the rate of genetic improvement in farm animals. Located there is the Imperial Bureau of Animal Genetics which abstracts and publishes world literature on the subject.

At the Hannah Dairy Research Institute, Kirkhill, Ayr, which is primarily for work on dairy cattle, work is also in progress on the means by which animals accommodate themselves to high temperatures—one of the problems underlying acclimatization in tropical countries.

At the University of Leeds and nearby at the Wool Industries Research Association Institute, Torridon, Leeds, work has been in progress on the chemical structure of wool, which has resulted in the production of non-shrinkable woollen goods.

At the Department of Agriculture, Aberystwyth, Wales, a recently established Department of Animal Health is commencing studies on animal nutrition and production in relation to conditions of grassland improvement in hill areas of Wales.

The Animal Nutrition Institute attached—until recently when it was liquidated—to the School of Agriculture, University of Cambridge, was divided into several sections. One, dealing with poultry genetics is being maintained as an Agricultural Research Council unit. This has been producing new sex-linked breeds in which the sex of the chick is marked by differential down colorings at hatching, and in conjunction with the Cheshire School of Agriculture, Reaseheath, Cheshire, has been producing inbred lines of poultry and testing crosses between them for egg production. Blood groups and inheritance of other characters are also being studied. The Poultry Nutrition section has studied the nutrition requirement necessary for egg production and growth. The Feedingstuffs Section has investigated the nutritive value of grass at different stages of growth, which has led to the introduction of grass drying into agricultural practice. It has also studied the nutritional requirements of the bacon pig. The Physiological Section has concentrated mainly on problems of reproduction and fertility, together with growth and meat production. Facts collected from the livestock industry have been used to show the major problems, and investigations on these have been undertaken experimen-

tally. Experiments in artificial insemination led to the first long distance transport of semen and the establishment of the first commercial Artificial Insemination Station in Britain at Cambridge. Methods for the treatment of sterility in horses, cattle and sheep have been developed, especially in connection with the use of hormones and it has been found possible to cause the production of twins and triplets in cattle by this means, and by controlling daylight hours to make sheep breed out of season. Experiments on horses have been carried out in conjunction with the Veterinary Research Trust's establishment at Newmarket. The way in which the animal grows to produce meat has been studied and visiting research students have shown how it is possible to control the shape of the animal and its meat qualities by changing the plane of nutrition on which it is fed during growth, both before and after parturition. These have been done in conjunction with the meat section of the Low Temperature Research Station, Cambridge.

In conclusion—Britain has been called the Stud Farm of the World in that the breeds of horses, cattle, sheep and pigs developed here have been, and are being, exported to every Continent. Superimposed on this sound practical basis of animal breeding we now have a number of scientific research centers which are reinforcing it by bringing all the latest advances in Science to its aid.

New Projects In Kentucky

Better relations of farmers with business men and the industrialists is a new project of the Kentucky Farm Bureau. Just recently 200 delegates to the state convention from about 40 counties came a day early to tour six factories in Louisville that process farm products and manufacture farm supplies and equipment, to see what is involved in the handling of commodities after they leave the farm.

None of them had ever been in a big packing plant before. None had seen the expensive machinery or the involved process of removing all weed seed from field seed and treating the latter to prevent disease or insect destruction. All grew tobacco, but none had seen it processed into cigarettes and smoking tobacco.

But when they returned from the trip planned and executed by the Kentucky Farm Bureau News staff, they could tell much about the problems of the other fellow. Outspoken about their broadened understanding, they had nothing but praise for the idea.

—The Nation's Agriculture

For the Farmer's Library

The Business of Farming—By Herrell DeGraff, Prof. Agri. Economics, Cornell Univ., and Ladd Haysted, farm journalist. Univ. of Okla. Press. $3.00.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $3.50.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. College Book Co. $4.75.

Dairy Cattle Feeding and Management—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.50.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. Dairy Husbandry, Univ. of Minn. J. B. Lippincott Co. $4.50.

Diseases and Parasites of Poultry—By Edgar Hugh Barger, D. V. M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition. $3.75.

Commercial Poultry Farming—By T. Burr Charles, Dept. Poultry Husbandry, Univ. of N. H., and Homer O. Stuart, Dept. Poultry Husbandry, R. I. State College. Interstate Printers & Publishers. $4.00.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $6.00.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. $3.50.

Grow Your Own Fruit—By M. G. Kains, formerly U. S. Dept. of Agri.; Prof. of Horticulture, Penn. State College. Greenberg, Publisher. $3.50.

Livestock Judging Handbook—By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The Interstate Printers. $3.25.

Natural Principles of Land Use—By Edw. H. Graham, Chief of Biology Div., Soil Conservation Service. Oxford University Press. $3.50.

Fur Farming for Profit—By Frank G. Ashbrook, Fish & Wildlife Service, U. S. Dept. Int. Orange Judd Publ. Co. $4.00.

Pay Dirt—Farming and Gardening with Composts—By. J. I. Rodale. Devin-Adair Co. $3.00.

The Earth's Face and Human Destiny—By Ehrenfried Pfeiffer, Director Bio-chemical Research Laboratory, Dornach, Switzerland; foreword by Sir John Stapledon. Rodale Press. $2.75.

Practical Farming for the South—By Benjamin F. Bullock, now Prof. Rural Education, Atlanta Univ. Univ. of N. C. Press. $3.00.

Profitable Poultry Keeping—By H. Clyde Knandel, Head, Dept. Poultry Husb., Penn State College. Orange Judd Publ. Co., Inc. $3.00.

Starting Right with Turkeys—By G. T. Klein, Extension Poultryman, Mass. State College; edited by Ed Robinson. The Macmillan Co. $2.50

Successful Poultry Management—By Morley A. Jull, Professor and Head of Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $3.50.
The "Have-More" Plan—By Ed and Carolyn Robinson. The Macmillan Company. $3.49.

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BOOKS OF INTEREST

MALABAR FARM — By Louis Bromfield, [illegible] farmer conservationist; Illustrated by Kurt Lee.

In this delightful and important new book [illegible] at "Pleasant Valley." This story of [illegible] told in Mr. Bromfield's convincing and [illegible] of a field, the blossoming of a weedy hill, the [illegible] of cattle becomes exciting drama. Almost [illegible] of extracts from the Malabar Journal [illegible] of life at the Farm. Here is a [illegible] equalled picture of accomplishment at Malabar—of country life as it can be and is lived. Let us send you a copy.

Publishers: Harper & Brothers [illegible] pages [illegible]

COUNTRYMAN'S COMPANION — Collected and [illegible] by David B. Greenberg, author, farmer; decorations by [illegible] son, artist.

Here is a treasury of farm literature from ancient to modern times, written to give you exciting reading and good counsel. The book is full of "farm life adventures, such as sheep raising in Montana, [illegible] up-state New York, horse raising in the West, bee-keeping, [illegible] thing from earth-worms, beans, poultry and cattle, to [illegible] ing machines." The *Countryman's Companion* presents country life as an art, as a philosophy, and as a practical way of life. The best of the pieces making up this collection is the dirt farmer. You will want a copy of this delightful volume. It will make an excellent gift for your [illegible]

Publishers: Harper & Brothers 412 pages [illegible]

WILD FLOWER GUIDE — By Edgar T. Wherry, Professor of Botany at the University of Pennsylvania. Illustrated by [illegible] Hoffmann.

The "Wild Flower Guide" for the northeastern and middle United States makes it easy to locate all important information about any wild flower you find, giving its common name, its scientific name, range and habitat with suggestions for its culture. The book is beautifully illustrated in full color and in black and white. Over 500 species of American wild flowers are listed and organized for easy identification.

For those interested in Wild Flower Conservation practices on their country places in woodland, meadow or marsh, this will be a most helpful book.

Doubleday & Company, Inc. 302 pages [illegible]

THE EARTH'S GREEN CARPET — By Louise E. Howard, author, and associate of Newnham College.

This is a short popular account of the ideas for a reformed agriculture which inspired the work of Sir Albert Howard, formerly Director of the Institute of Plant Industry at Indore, Agricultural Adviser to [illegible] Central India and Rajputana, and author of "An Agricultural Testament." Lady Howard writes convincingly for those interested in [illegible] welfare and in the use made by man of the earth's rich mantle of vegetation, the source of his food and of his raw materials, and without which mankind would vanish from the surface of the earth.

Rodale Press 250 pages [illegible]

"Chief harvest of the land is Man himself. From the soil comes the quality of his bone and muscle. What he is, what he does, how he does it, are determined by the acres that he tills. His courage, his ambitions, his very way of thinking, grow out of the furrows at his feet as truly as the wheat and cotton and clover he tends."

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